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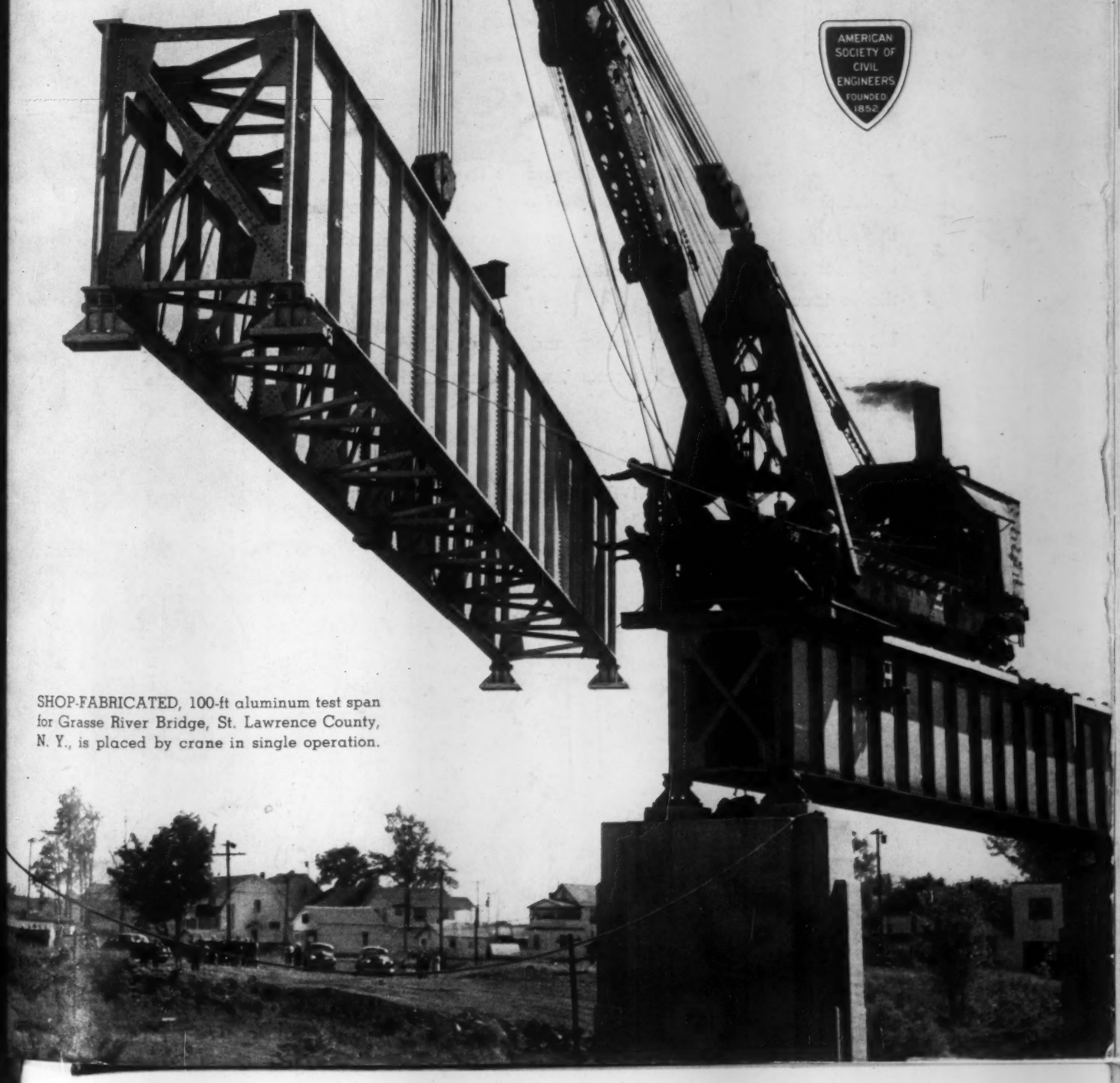
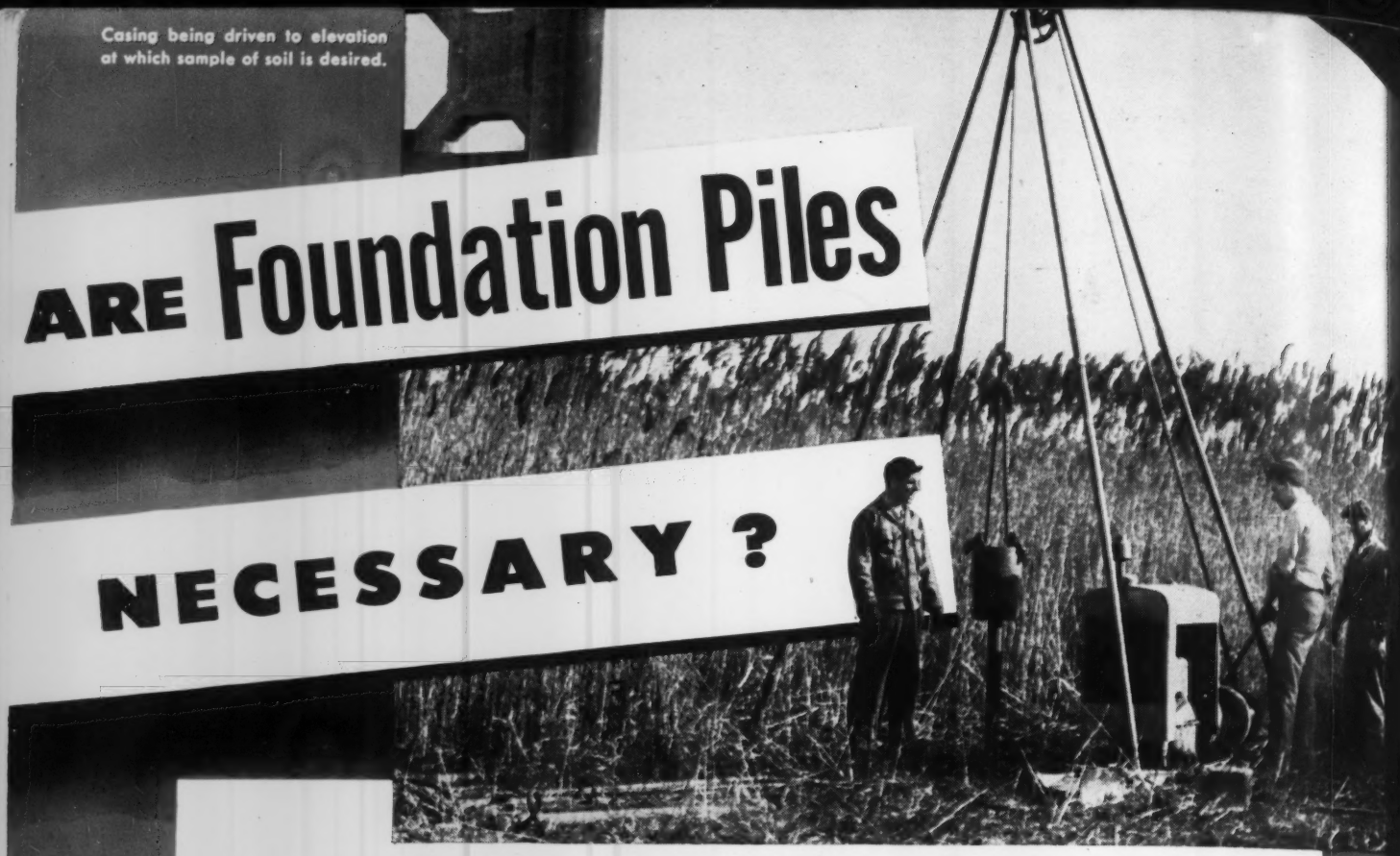
AMERICAN SOCIETY OF CIVIL ENGINEERS FOUNDED 1852



SHOP-FABRICATED, 100-ft aluminum test span for Grasse River Bridge, St. Lawrence County, N. Y., is placed by crane in single operation.



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Among Our Writers

ELMER B. ISAAK (Cornell U., A.B. '33, C.E. '35) has been with the engineering firm of Madigan-Hyland since graduation. He has been in charge of numerous engineering surveys and reports prepared for the Triborough Bridge Authority, Navy Dept., and other public agencies. Currently he is responsible for the firm's survey of New York's airport program.

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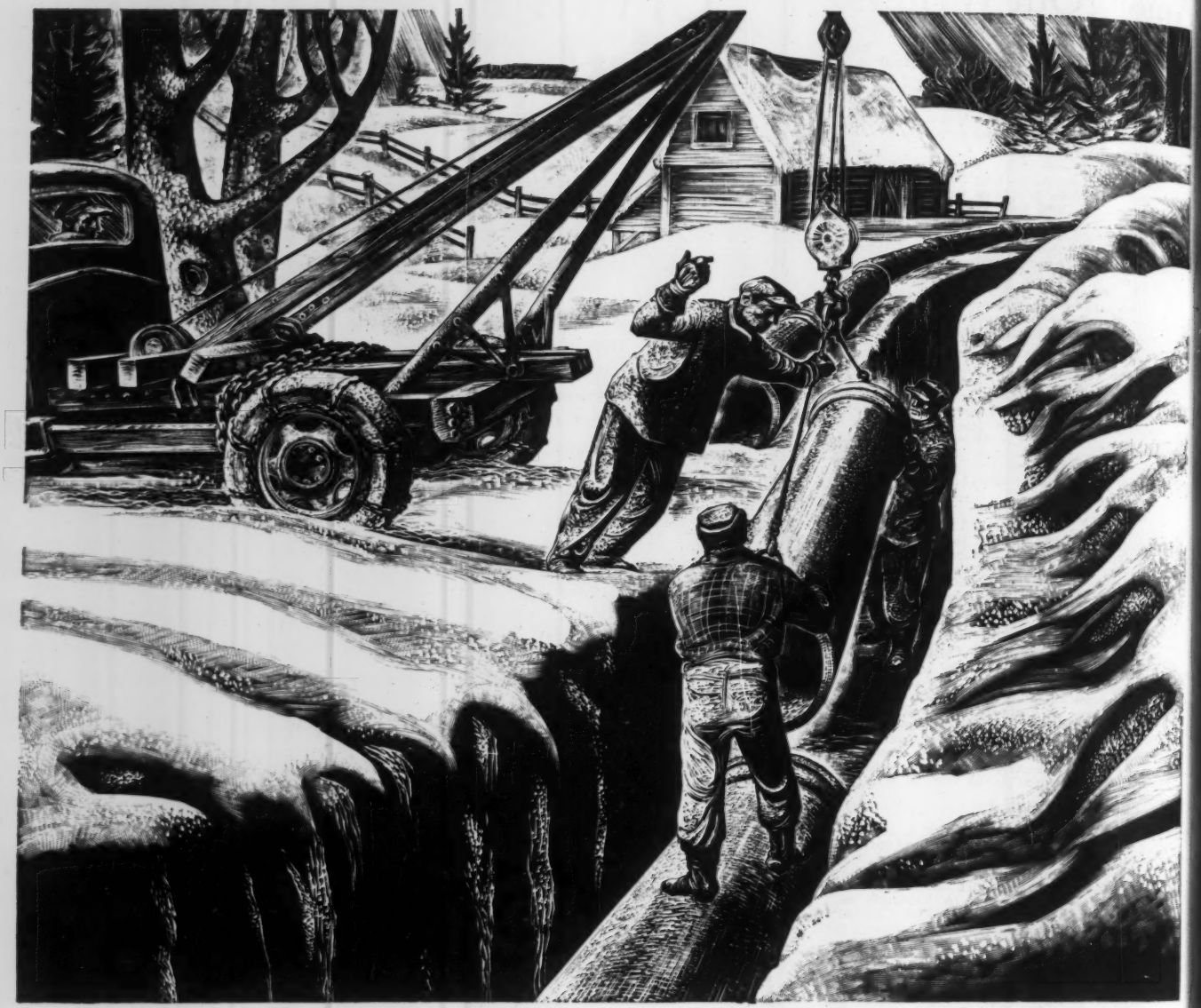

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VOLUME 16 — DECEMBER 1946 — NUMBER 12

Plans for Ninety-Fourth Annual Meeting Near Completion

FEATURING a fine array of technical papers, nationally prominent speakers, and open forums on subjects of vital interest to civil engineers—plus carefully planned social get-togethers and entertainment—the Ninety-Fourth Annual Meeting of the Society, January 15 through 18, is rapidly approaching final stages of completion. Meeting headquarters for all technical sessions and social events will be the Hotel Commodore, 42nd Street and Lexington Avenue, New York.

A general business session Wednesday morning, January 15, opens the meeting—technical sessions begin Wednesday afternoon and continue through Friday morning, January 15, 1947. A complete program of the meeting will appear in the January 1947 issue of CIVIL ENGINEERING.

At the opening session—in the Grand Ballroom of the Hotel Commodore—reports on the Society's operations during 1946 will be presented and newly elected officers will be introduced, following which honorary memberships will be conferred. Winners of prizes and awards have been selected and awards will be presented at this session. This year the prizes and awards include:

Norman Medal
J. James R. Croes Medal
Thomas Fitch Rowland Prize
James Laurie Prize
Arthur M. Wellington Prize
Collingwood Prize for Juniors
J. C. Stevens Award
Construction Engineering Prize

Honorary membership is to be conferred upon four distinguished members of the Society. To be so honored are: A. W. K. Billings, Rio de Janeiro Tramway, Light and Power Company, Ltd., Rio de Janeiro, Brazil; Charles B. Burdick, consulting engineer, Chicago; A. P. Greensfelder, chairman, Fruin-Colnon Contracting Co., St. Louis; and Leroy K. Sherman, consulting engineer, Chicago.

MAKE HOTEL RESERVATIONS IN ADVANCE

Because of the scarcity of hotel rooms it is important that reservation requests be made as early as possible in advance of departure for New York. The Hotel Commodore has agreed to make a certain number of rooms available. Requests for reservations at the Commodore should state that they are for attendance at the ASCE Annual Meeting and should be addressed to the attention of Mr. William Buckley, public relations. Hotels will mail confirmation of reservations direct to members.

For the benefit of those who may have preference for hotels other than the Commodore, following is a list of rates.

HOTEL RATES

HOTELS	SINGLE	DOUBLE
Ambassador	6.00 up	8.00 up
Astor	3.50 up	5.00 up
Barclay	6.00 up	8.00 up
Biltmore	5.50 up	7.50 up
Commodore	3.50 up	5.50 up
Governor Clinton	3.30 up	4.40 up
Lexington	4.00 up	6.00 up
McAlpin	3.30 up	4.95 up
New Yorker	3.85 up	5.50 up
Pennsylvania	3.85 up	5.50 up
Plaza	6.00 up	8.00 up
Roosevelt	4.50 up	6.50 up
Shelton	3.85 up	5.00 up
Taft	3.00 up	5.00 up
Waldorf-Astoria	7.00 up	10.00 up
Wellington	3.00 up	4.00 up
Wentworth	3.00 up	5.00 up
Woodstock	3.00 up	4.00 up

WEDNESDAY LUNCHEON

At the close of the opening session, members, ladies, and guests will assemble for a general luncheon in the hotel. Plans are being made for some outstanding speaker to address the group at the close of the luncheon.

ENTERTAINMENT FEATURES

On Wednesday evening, January 15, the formal dinner and dance will be held in the Grand Ballroom of the Hotel Commodore. On Thursday evening, January 16, a dinner-smoker will also be held at the Commodore. As in past years this occasion will provide an opportunity for various college alumni groups to meet at dinner before the smoker. These reunions can be scheduled for Thursday evening at the Commodore if desired to permit ready attendance at the smoker.

MEETINGS OF TECHNICAL DIVISIONS

The following Technical Divisions are scheduled for sessions, all of which will be held on the ballroom floor of the Commodore:

WEDNESDAY AFTERNOON, JANUARY 15
City Planning Division
Hydraulics Division
Sanitary Engineering Division

THURSDAY MORNING, JANUARY 16
Hydraulics Division
Sanitary Engineering Division
Soil Mechanics and Foundations Division
Waterways Division

THURSDAY AFTERNOON, JANUARY 16
Engineering Economics Division
Highway Division
Soil Mechanics and Foundations Division
Structural Division

FRIDAY MORNING, JANUARY 17
Power Division
Surveying and Mapping Division

EXCURSIONS FRIDAY AFTERNOON AND SATURDAY MORNING

On Friday afternoon, January 17, a bus excursion is being planned to various housing projects of the New York City Housing Authority, ranging in size from 600 to 1,800 families. The route chosen for the excursion will permit visitors to view housing developments in various stages of construction. The trip will include a visit to a completed project.

On Saturday morning, January 18, a bus excursion is to be made to Lake Success, Long Island, to visit the

(*Continued on page 558*)

New Wholesale Produce Market to Dissolve Truck Congestion

By ELMER B. ISAAK, Assoc. M. ASCE

MADIGAN-HYLAND, CONSULTING ENGINEERS, NEW YORK, N. Y.

OPERATION of New York City's new wholesale produce market, now in the design stage, will not be paralyzed by congested trucking. Flexibility is the special feature of the projected market place. Annual savings of millions of dollars will be effected through extensive use of modern materials-handling equipment. Construction of the new facilities will follow unusual designs prepared to provide for large-scale transfer of perishables.

A NEW field of civic improvement will be opened up with the construction of New York's $42,000,000 wholesale fruit and vegetable market. This project will make possible the efficient handling of some $400,000,000 worth of foodstuffs annually, eliminating many present wasteful practices.

The development of the existing market and its essential characteristics were described in an earlier article by Clinton F. Loyd (CIVIL ENGINEERING for September 1946) which summarized the principal facts uncovered by two years of intensive research into the market's operations. Analyzing those facts led to the establishment of three important principles for the design of the new market:

1. Flexibility of movement must be maintained. Produce arriving at the market is handled in so many different ways and flows through such a multiplicity of channels that free movement from any one part of the market to every other part is absolutely essential.

2. The truck traffic problem must be solved. The remarkable fact revealed by extensive traffic surveys is that the number of trucks involved is relatively small—not over 5,000 on a peak day before the war. Congestion is produced by completely inadequate facilities, and the solution is readily available by providing:

   a) Adequate tailboard space
   b) Sufficient street width for trucks to back up to buildings while loading, plus room for moving traffic
   c) Proper parking space for idle vehicles

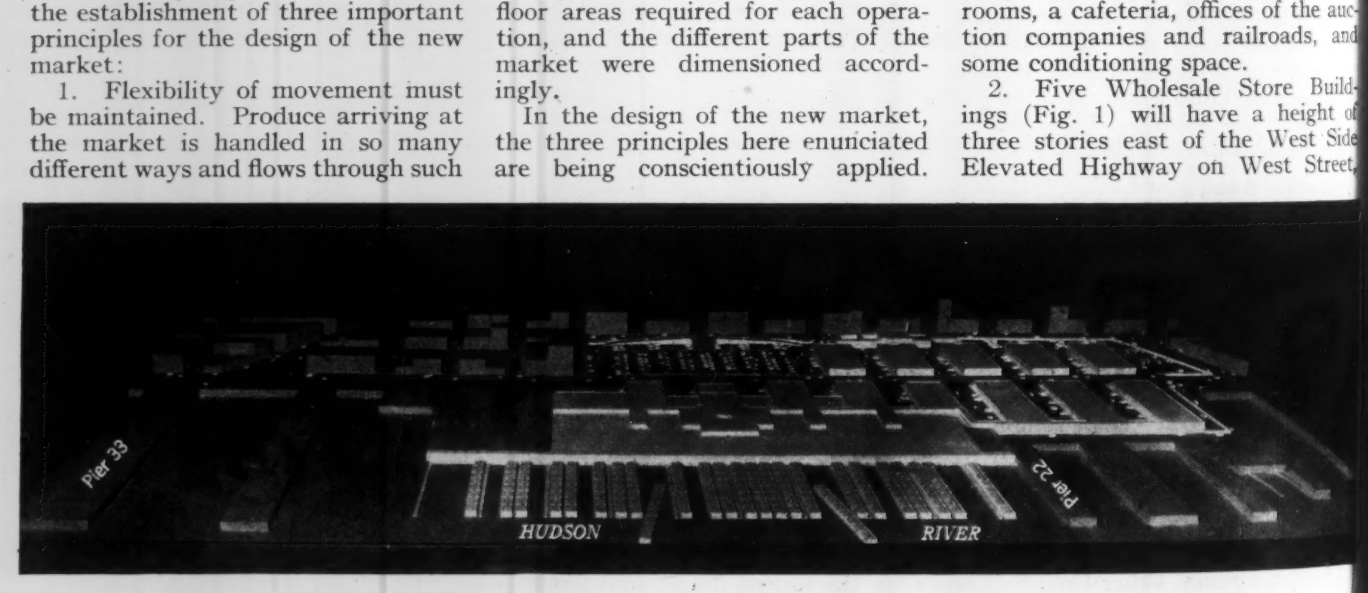
3. The market must be capable of handling the peak day. Since a peak occurs every Sunday night, and approximately one-third of the week's receipts usually arrive during its first day, the space provided in the market must provide for this inflow. A margin should be allowed for extra loads imposed by special peak days caused by holidays or certain seasonal conditions, but advantage may be taken of the fact that only about 68% of the peak day's load is in the market at any one time. Special surveys were made to determine the floor areas required for each operation, and the different parts of the market were dimensioned accordingly.

In the design of the new market, the three principles here enunciated are being conscientiously applied. The exhaustive data developed by research have been adapted to produce the basic plan for the market, the essential features of which will be described.

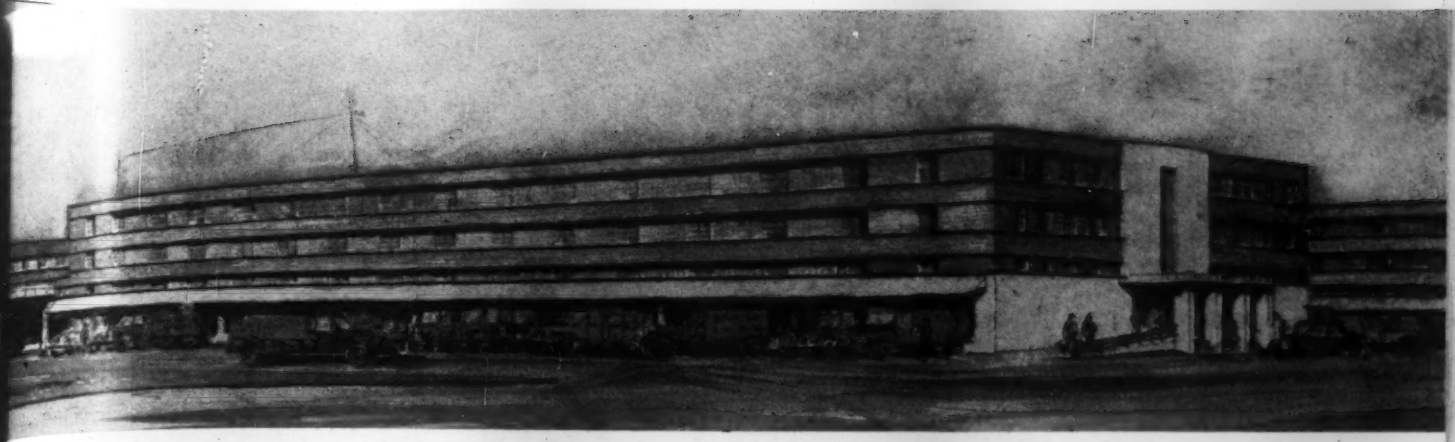
The new market (Fig. 1) will occupy essentially the same site as the present market activities, extending from Laight Street to Murray Street, between Greenwich Street and the Hudson River. Its area will be about 57 acres, of which 34 are to be covered by buildings and 23 by streets and parking spaces. All existing buildings in the area are to be demolished and the entire project is to be built in stages over a two-year period, during which time suitable arrangements will be made for maintenance of trade in the area. The principal parts of the plan are:

1. The Distribution Hall, for auction and private sales, will have a single large, enclosed floor with an area of 675,000 sq ft, equivalent to the total pier space now used by all railroads for handling the same produce. The hall will be constructed over water and will be supported on pile foundations. Along the bulkhead on the river side of the building, 40 carfloats will be able to tie up in ten slips formed by pile fender racks. Over part of the Distribution Hall floor there will be a second story to house the auction salesrooms, a cafeteria, offices of the auction companies and railroads, and some conditioning space.

2. Five Wholesale Store Buildings (Fig. 1) will have a height of three stories east of the West Side Elevated Highway on West Street,



SCALE MODEL HELPS TO VISUALIZE RELATIONSHIP OF PARTS TO ONE ANOTHER AND TO SURROUNDINGS
View Looking East from Hudson River; in Center Foreground Are Slips with Their Carfloats



WHOLESALE STORE BUILDING LOOKING NORTHWEST
At Extreme Left, West Side Elevated Highway Is Shown Cutting Through Building

and a height of two stories west of it. The highway runs through the buildings at the level of the second story, leaving ample headroom over each main floor, which is a continuous clear platform 140 ft wide, raised above the street to truck-loading height. Each platform floor will have a 30-ft-wide central aisle for the display of commodities by merchants and for the circulation of customers. On each side of this aisle will be the wholesale stores. It is planned to separate adjacent stores from each other by movable, open-grill partitions. Loading from the stores will be at the outside building walls, where trucks will back up to overhead doors through which produce can be moved. Each store unit will extend from the street to the central aisle and will be 11 ft wide and 55 ft deep. A merchant may rent as many units as he desires.

The upper floors of the store buildings will be devoted to office space on the outer perimeters and storage space in the center. A tenant with a store on the main platform can thus rent office or storage space directly overhead, with access by means of prefabricated staircases, which can be installed and shifted as necessary. The storage space can be equipped, when required, for refrigeration and conditioning purposes. Freight elevators at the ends of each building are to be provided for vertical transportation of produce.

3. There are three Delivery Platforms, from which incoming produce is to be delivered direct to consignees located outside the market area. These are essentially one-story buildings, similar to the main floor of the store buildings, but without any partitions. The western (river) end of each platform has a second story which is an extension of the offices and other rooms over the Distribution Hall. East of the Elevated Highway, the Delivery Platforms will be covered by a second-deck parking field, approached from the street level by ramps.

4. The Administration Building (Fig. 1) is planned as a separate three-story structure to house executive offices of the market operating agency, hiring office for agency personnel, restaurant, banking facilities, sleeping quarters for truckmen, central power plant, repair and maintenance shop, and several stores for establishments supplying goods or services incidental to market operations.

5. Market streets between buildings are to be 110 ft wide, allowing sufficient width for moving traffic and for trucks backed up to the buildings on both sides of the street. The access street running the length of the market is 50 ft wide, with no parking lanes.

6. Ten acres of parking space are provided; five are in the surface fields running practically the full length of the market, and another five are on the second deck above the Delivery Platforms. This parking field will be at the same level as the Elevated Highway, to which a direct connection can readily be made.

HOW THE PLAN OPERATES

"Rail receipts" arriving by carfloat at one of the ten slips will be loaded by the railroad companies onto the Distribution Hall floor, the cost of this operation being included in the basic freight rate. Carlots are stacked as units. After inspection by prospective buyers, the produce will usually be sold at auction or by private sale. Following purchase, the buyer will arrange for transportation of the merchandise either to his market store or to a truck at one of the three Delivery Platforms where he has been assigned space for handling his transfer. In the latter case, the produce will be taken directly out of the market without passing through a market store.

Some shipments arriving at the Distribution Hall will be consigned to receivers wishing direct transfer to their market stores, without an intermediate sale on the main floor. This is a simple operation, which can be made directly from the carfloats.

Internal transportation of produce from the Distribution Hall to stores or to Delivery Platforms will be by tractor-trailer trains operated under the control of the market agency. At stores or Delivery Platforms, trailers can be detached and either unloaded on the floor or pushed directly into trucks backed up at the platforms. This method of handling intra-market movements is par-

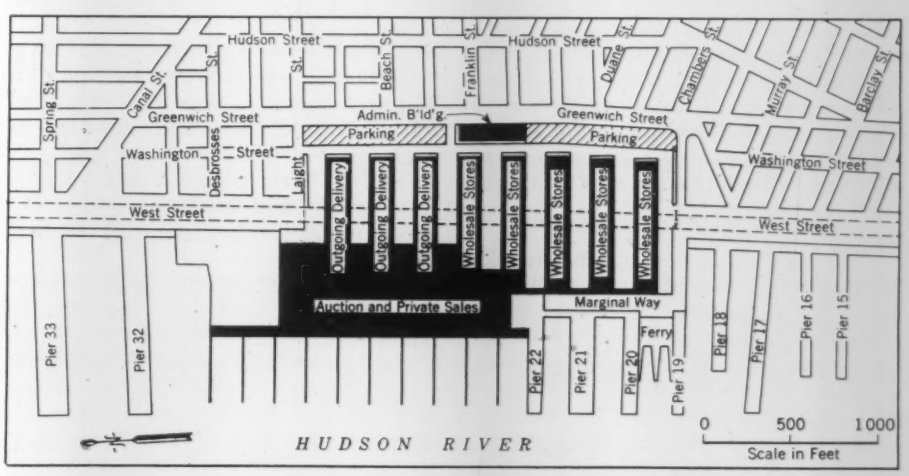


FIG. 1. GENERAL PLAN OF WHOLESALE PRODUCE MARKET, SHOWING LOCATION OF COMPONENT PARTS

ticularly well suited to the flexible type of operation required for efficiency in the market.

An appreciable tonnage of rail-borne produce arriving in the metropolitan area is brought to team-tracks in Manhattan, in Jersey City, or in other railroad yards in the metropolitan area. About one-half of this tonnage is hauled away directly from the cars to buyers' establishments located outside the Lower Manhattan Market. The other half is brought by truck to stores inside the market, and in the new market this produce will be unloaded directly into the stores from the trucks.

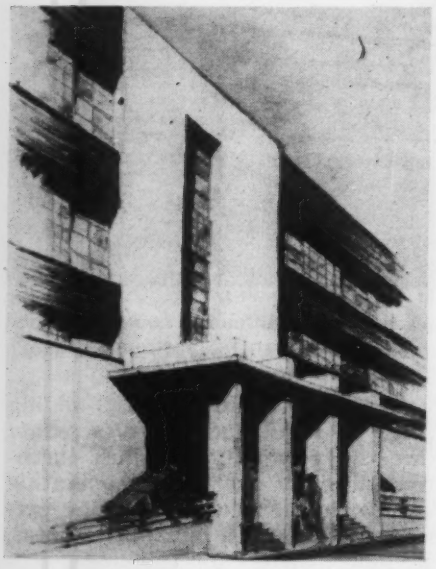
Over-the-road trucks bringing produce to market will generally deliver directly to the stores of dealers who buy their goods. Each dealer will have sufficient tailboard space to receive his deliveries at his store front. The easy accessibility of the large Distribution Hall may lead to direct truck unloads at that location or at the Delivery Platforms by growers or merchants wishing to sell such produce at auction or dock sale.

Boat-borne produce comes in at the regular piers of the steamship companies, and about half of it never goes through the Lower Manhattan Market. Most of the tonnage that does enter the new market will be trucked directly to dealers' stores; a lesser amount will be brought by truck to the Distribution Hall for use as auction samples. Goods sold by auction from these samples will be delivered direct to the buyers from the steamship piers. If an operator should ever prefer to unload a ship directly at the market, he can do so at Pier 22 (Fig. 1), which will be interconnected with the Distribution Hall floor.

It is to be noted that while produce travels to New York by various means, it normally enters the market in only two ways—from carfloats onto the railroad piers and by truck. Trucks carry 55% of all produce into the market, and they carry practically 100% of it out. This is an overwhelming consideration in the design.

TRUCK TRANSPORT FACILITIES

Principal demands of the trucks in the market are adequate tailboard space for delivering and picking up produce; streets of sufficient width to allow parking perpendicular to buildings on both sides, plus free-flowing traffic between; convenient parking space; proper means of access for market traffic; and freedom from interference by non-market vehicles.



ENLARGED STUDY SHOWING ENTRANCE TO WHOLESALE STORE BUILDING

The requirements of tailboard space dictated the long, fingerlike shape of the delivery platforms and store buildings. This arrangement is intended to allow each truck to back up to its precise delivery or pick-up point with a minimum of delay.

The 110-ft streets between buildings are generous enough to handle any probable traffic situation. The large majority of trucks used in the market are two-axled vehicles averaging about 21 ft in length (principally outgoing delivery trucks). Combination truck trailers average about 37 ft (principally incoming trucks); the longest one observed during a survey was 43 ft 8 in. Therefore the streets have ample width for both parked and moving trucks.

It is not planned to permit inactive parking on the market streets, but the ten acres of parking space provided under the plan is considered adequate for all needs. The entire market area will be fenced off, with entrances and exits placed at a limited number of convenient points. Through traffic on West Street will be routed around the market via Greenwich Street, which will be widened to 80 ft. West Side Elevated Highway traffic will be carried directly through the market, without mutual interference.

The traffic situation will be further benefited by the use of trailer trains for intra-market movements. These trains will operate on their own rights of way inside the buildings, and will not interfere with the truck traffic in the streets. This method of transportation has great advantages of economy and extreme flexibility, and appears especially well suited to the peculiar requirements of the market.

The new market is expected to bring about annual savings of many millions of dollars in operating costs. Reductions in handling expense have been estimated at over five millions a year, attributable largely to the introduction of modern materials-handling equipment, provision of adequate space for free movement, and elimination of unnecessary porterage in the loading and unloading of vehicles. Construction of the first-floor level at platform height will of itself wipe out the necessity for manually hoisting literally millions of crates each week to and from the tailboards of trucks.

Additional major economies will result from the reduction of spoilage, waste, and pilferage of produce. Some losses are bound to occur in any market, but it is evident that present conditions in Washington Street and on the piers contribute materially to make this item large. Lack of sufficient heat and exposure to the elements are important factors contributing to the high spoilage rate. The new market will be housed in interconnected, heated buildings, affording protection from the weather at all times. Excessive handling and cartage over bumpy surfaces further add to the physical damage, and provisions for refrigeration are inadequate. These handicaps will both be overcome in the new development. Furthermore, the efficiency of the new market will noticeably reduce the time required for produce to pass through on its way to retail outlets.

The present system of driving trucks onto the piers is believed to afford one of the important opportunities for pilferage. This practice is automatically eliminated by the raised platforms of the proposed plan. The entire compound will be fenced off and traffic will be controlled at the gates, only authorized vehicles being permitted to enter.

Since the proposed market will be a new, unified facility, maintenance and upkeep expenses will be substantially less than in the antiquated quarters at present occupied by the wholesale fruit and vegetable business. Merchants will also benefit by lower insurance rates and various other economies which they can effect in their own businesses.

Plans and specifications for the new market are scheduled to be completed in the near future, and the methods to be used in financing, construction, and operation are now in process of formulation.

All-Aluminum Span Carries Rail Traffic Over Grasse River Bridge

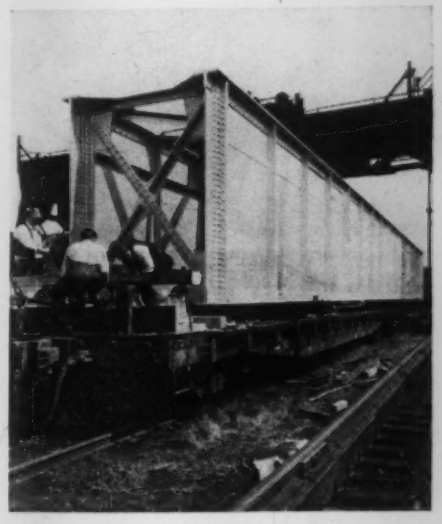
By SHORTRIDGE HARDESTY, M. ASCE
PARTNER, HARDESTY & HANOVER, NEW YORK, N.Y.
and J. M. GARRELTS, M. ASCE
PROFESSOR, DEPARTMENT OF CIVIL ENGINEERING, COLUMBIA UNIVERSITY,
AND ASSOCIATE ENGINEER, HARDESTY & HANOVER

DESIGN of the aluminum span here described was by the Aluminum Co. of America under the direction of M. W. Hanson, M. ASCE. The design then was reviewed and checked in detail by the firm of Hardesty & Hanover. Special investigations of materials and designs were made by the Aluminum Research Laboratories under the direction of R. L. Templin and E. C. Hartmann, Members ASCE. Aluminum alloy materials were produced by the Aluminum Co. of America. As for the new bridge as a whole, the piers and steel spans were designed by C. E. Smith & Co. of St. Louis, Mo., and the general contractor was the Harrison Construction Co. of Pittsburgh. Fabrication and erection of all spans was by the Bethlehem Steel Co.

ARE ALUMINUM ALLOYS suitable for railway bridge construction? For a number of years the Aluminum Co. of America has been seeking a project to demonstrate that this question should have an affirmative answer. It was recognized that there are problems of design, production of materials, fabrication, and behavior in service which can be answered only by building an actual bridge. In particular, allowance must be made for the fact that aluminum structures are necessarily more flexible than those of steel, since the modulus of elasticity of aluminum is about one-third that of steel.

The reconstruction of the Grasse River Bridge, near Massena, N.Y., offered the long-awaited opportunity to test aluminum alloys in an actual structure. This bridge is on the line of the Massena Terminal Railway, which handles a large part of the freight for one of the principal plants of the Aluminum Co., at Massena. Hence the railway's cooperation was secured in constructing one of the 100-ft spans of this bridge entirely of aluminum alloys. The location is well adapted to the installation and future study of such a span. Although the bridge is not required to carry heavy steam locomotives in regular service, they can be obtained for test runs. Also, direct comparison can be made between the behavior of the aluminum span and the adjacent steel spans, which are of equal length and designed for the same live load.

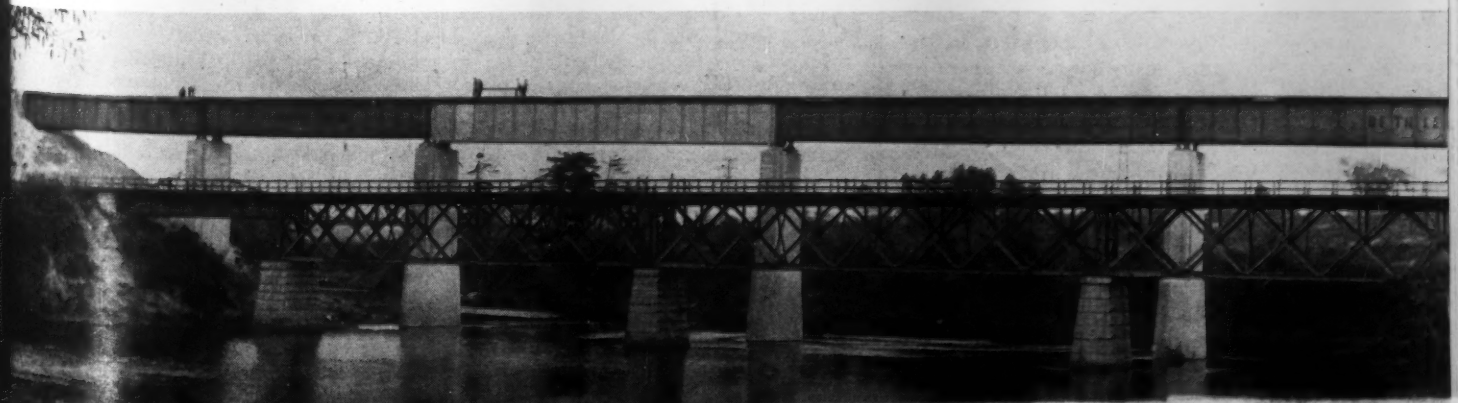
The Massena Terminal Railway Co. is a single-track switching and terminal railroad about two miles long which connects the New York Central Railroad and the Canadian National Railway with the industrial district of Massena, N.Y., and crossing the Racquette and Grasse rivers. Traffic consists entirely of freight, although there is a possibility of passenger traffic in the future. Motive power is provided by three Diesel electric locomotives rated at from 600 to 660 hp.



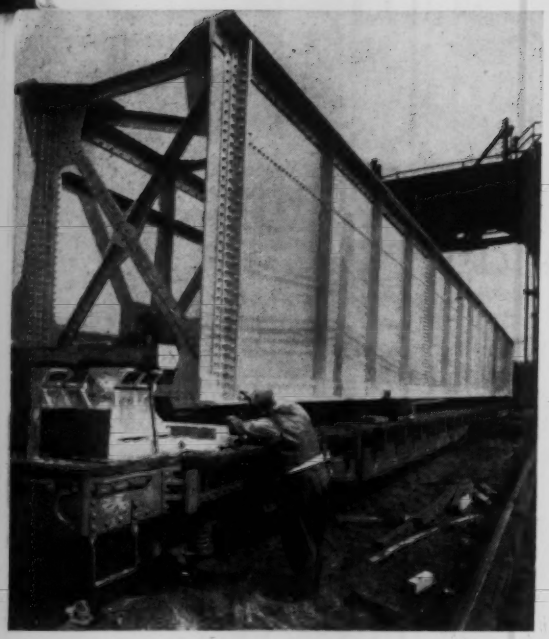
LIGHT-WEIGHT aluminum-alloy deck-plate girder is shipped from Bethlehem Steel Co. shops in Rankin, Pa., to site near Massena, N.Y., on two railroad flat-cars.

Development of the railroad required a longer interchange yard on the south side of the Racquette River, which made it logical to relocate and reconstruct the Racquette River Bridge. Since the original Grasse River Bridge was designed for Cooper's E-38 loading, it was imperative that it also be replaced, and in its reconstruction it was found possible to improve the grades by moving it 63 ft to the east, and raising the grade line 20 ft, or to about 60 ft above the water surface.

The original Grasse River Bridge, built in 1897, consisted of two deck plate-girder spans 50 ft long and four deck Warren-truss spans 100 ft long.



ALUMINUM SPAN (third from left) weighs only 53,000 lb compared with 128,000 lb for steel spans of same length at right. Old bridge is in foreground.



AFTER FABRICATION at Rankin Works of Bethlehem Steel Co., aluminum span is loaded on two flat-cars for shipment to site.

The new bridge consists of seven deck plate-girder spans, one of 90 ft, four of 100 ft, and two of 75 ft; it is designed for E-60 loading under AREA specifications for steel railway bridges.

For fifty years engineers have studied the characteristics of aluminum alloys in the hope that their light weight and high resistance to corrosion could be used to advantage in bridge building. During the first World War, heat-treated aluminum alloys, with strengths comparable to that of steel, were produced for the first time in this country. These were gradually improved until today aluminum alloys with tensile yield strengths in excess of 50,000 psi are available in a wide range of commercial forms. As a result of a progressive research program and a growing demand, three other major improvements have been made in recent years:

1. Resistance to corrosion of strong aluminum alloys has been increased by changes in composition and heat treatment, and by the development of alclad material.
2. Sizes of plates, shapes, and rivets have been increased to the point where they are satisfactory for major structures.
3. The price of aluminum products has been reduced.

During the recent war public knowledge of, and respect for, the strength and durability of aluminum alloys became widespread through experience in wartime applications.

On account of the foregoing developments, aluminum alloy shapes and plates are today available for bridge construction, and under some conditions may be able to compete on a cost basis with usual types of construction. However, those who design, build, and operate bridges must be conservative in design and in choice of materials, since public safety is involved. At the same time, bridge engineers are progressive and accept new methods and new materials when their worth has been demonstrated.

In 1933 aluminum alloys were used for the first time as a material for bridge construction. The steel and wood floor system of the Smithfield Street Bridge in Pittsburgh was replaced with an aluminum alloy floor. The weight was cut in half, thus making the old steel trusses and masonry foundations safe for modern highway and street railway traffic. This aluminum alloy floor is still functioning after more than 13 years of use and exposure to a corrosive industrial atmosphere. (See "Heavy Bridge Floor Replaced with Aluminum," J. P. Growdon, Ross M. Riegel, and R. L. Templin, Members ASCE, CIVIL ENGINEERING for March 1934.)

ADVANTAGEOUS IN MANY CASES

However the Smithfield Street Bridge is not an "aluminum bridge" since the trusses are steel. Studies for various bridges, including the Golden Gate and Mackinac bridges and the Cape Cod Canal lift span, have demonstrated that the high-strength aluminum alloys possess advantages in many cases where dead weight is a major factor. More recently aluminum alloys have been considered for locations where especially severe corrosive conditions make maintenance of steel structures difficult and expensive.

TABLE I. DESIGN FEATURES OF GIRDER SECTION

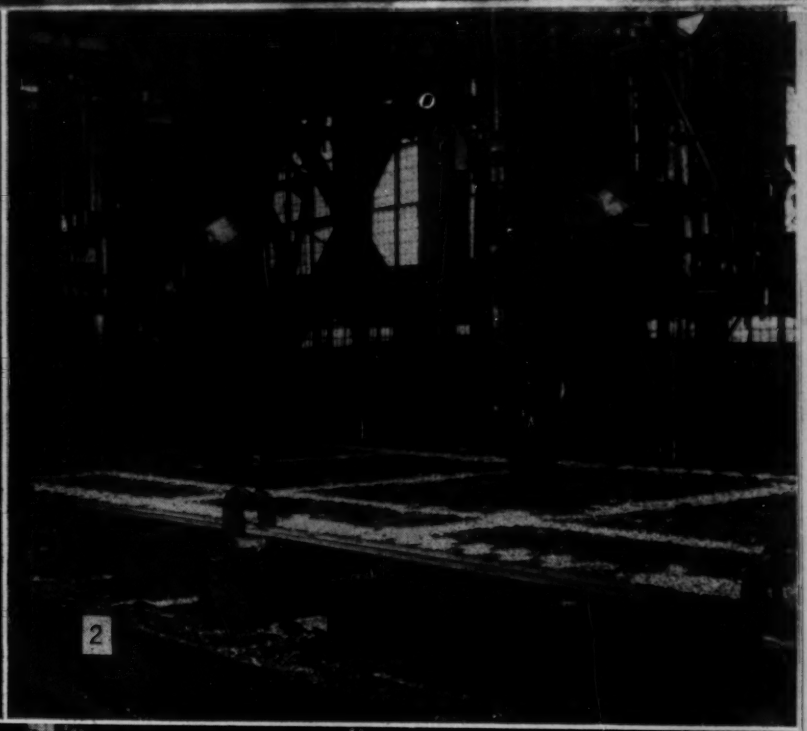
Maximum shear:	
Dead load (563 × 47.8)	27,500 lb
Live load E-60	220,300 lb
Impact 55.5%	122,200 lb
Total	370,000 lb
Gross area of web plate:	
120 × 3/4 in.	90 sq in.
Average unit shear:	
370,000/90	4,100 psi
Maximum moment:	
Dead load 1/8 × 563 × 97.5²	669,000 ft-lb
Live load E60	4,628,000 ft-lb
Impact load 55.5%	2,569,000 ft-lb
Total	7,866,000 ft-lb
Section modulus:	
Gross	5,690 in.³
Net	4,550 in.³
Extreme fiber stresses:	
Tension, 7,866,000 × 12/4,550 =	20,800 psi
Compression, 7,866,000 × 12/5,690 =	16,600 psi

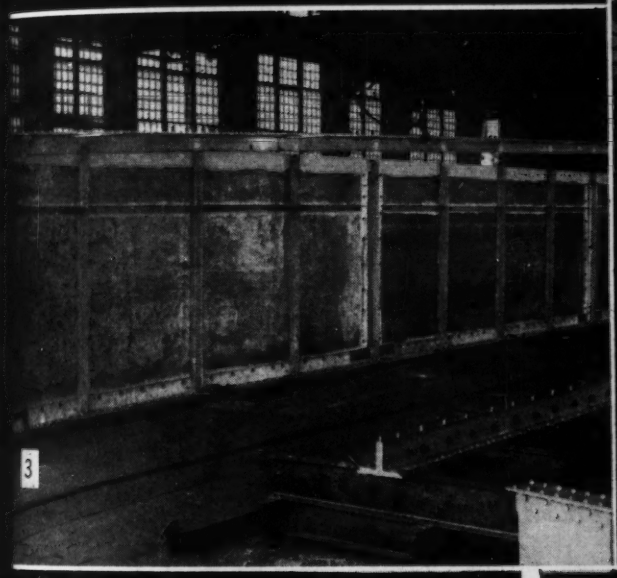
For the Grasse River span, aluminum alloy 14S-T was selected for the following reasons: It combines the advantages of high strength, good resistance to atmospheric corrosion, adaptability to the manufacture of large plates, rolled shapes and extruded sections, and working characteristics well suited to standard fabricating practices. It has been used for over 25 years for heavy-duty forgings, providing maximum strength with minimum dead weight, in applications such as aircraft parts, bails for power-shovel dippers, and machine parts. It has also performed satisfactorily in very large civilian

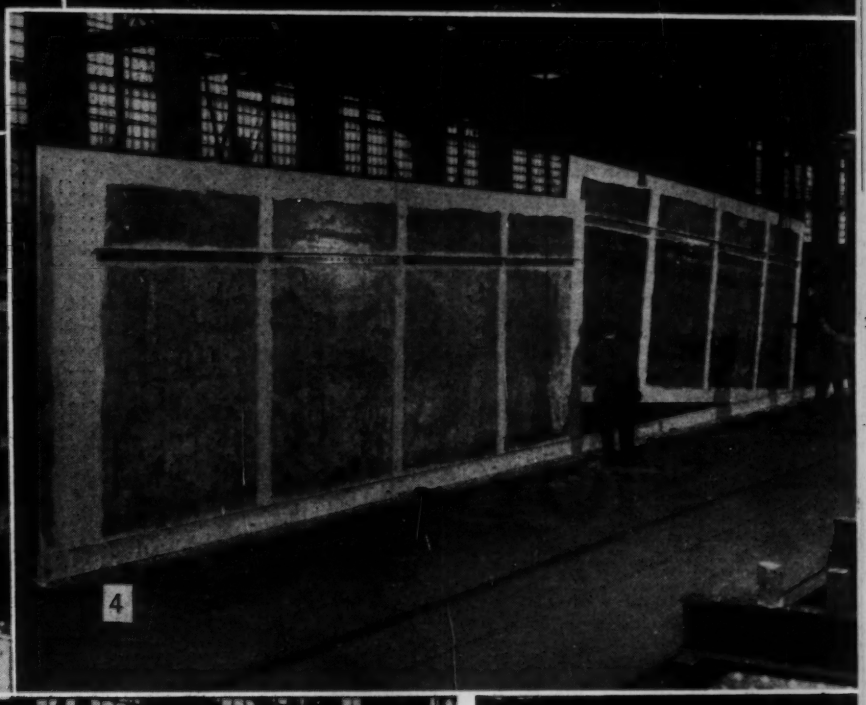
Aluminum Span Fabricated in Structural Steel Shop

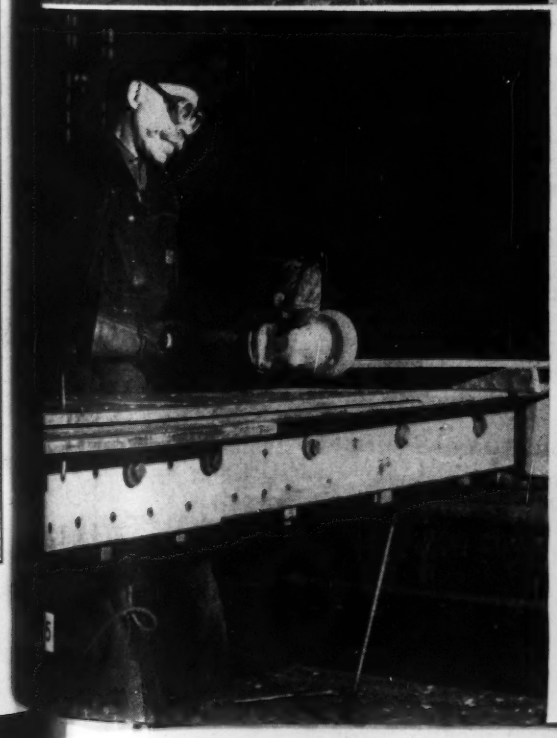
FABRICATION OF THE ALUMINUM ALLOY SPAN was done in the Rankin plant of the Bethlehem Steel Co., a standard structural shop using the equipment and following the procedure normally employed for steel structures. The deviations from steel fabricating practices were minor with the exception of riveting. Most rivets, 7/8-in. dia alloy Al7S-T, were driven cold with squeeze riveters. Where space limitations prevented the use of squeeze riveters, aluminum alloy rivets, 7/8-in. dia alloy 53S-W, were driven hot with pneumatic hammers. These were heated to the heat-treating temperature of 1030 to 1050 deg F and developed their strength through the quenching received by the contact with cold metal and tools.

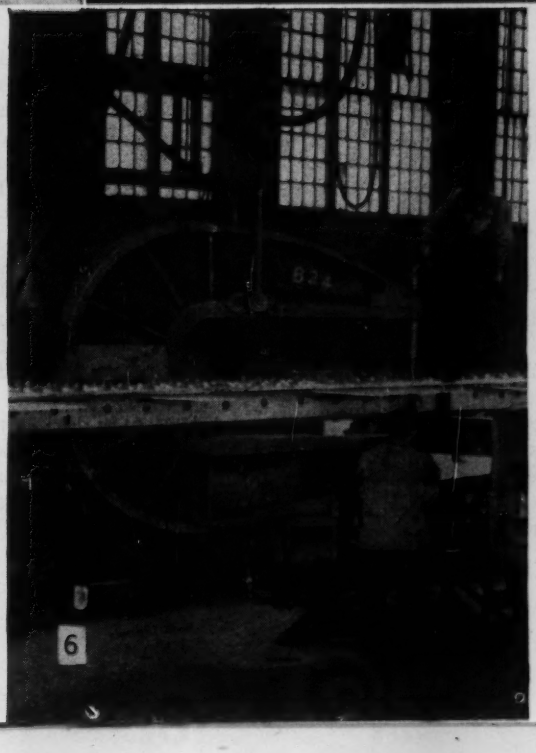
Reduction in weight—53,000 lb as compared to 128,000 lb for the adjacent steel spans of the same length—made it possible to complete the assembly of the aluminum span in the shop and to transport and erect it in one piece, eliminating all field assembly. In the heavier steel span, it was necessary to ship and erect the individual girders separately and to assemble the lateral bracing in the field. The shop assembly of the aluminum span permitted a saving in the cost of fabrication and reduced the time for field erection from approximately 2 days to less than one-half day. Photographs on the facing page show: (1) Because of variable spacing, rivet holes in flange angles and web plates are laid out by hand. (2) Fluted spiral twist drills sub-drill rivet holes in a web plate. These drills are used on all material 1/2 in. or more thick. (3) Top flange is lowered onto the web plate. (4) Four web plates are inserted into lower flange in "fitting-up" operation, then web splice plates and stiffener angles are added. (5) Cover plates on flange assemblies are fitted by hand to insure complete bearing. (6) Horseshoe-type squeeze riveter, 80-ton capacity, rivets flange assembly. (7) Stationary mounted horseshoe-type riveter places 7/8-in.-dia cold 528 driven rivets in cross-frame subassembly.

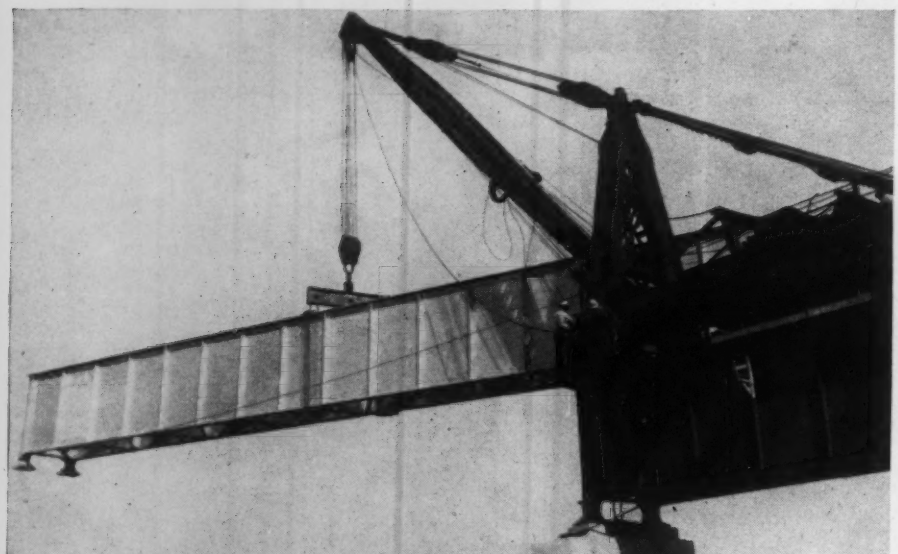












CRANE SWINGS shop-fabricated aluminum span into place. Same crane handles but one steel girder at a time for field fabrication of span.

and military planes and in the floor system of the standard M4 ponton bridge of the U.S. Army. Through years of research and process development, the cost of production has been reduced and equipment has been designed to roll large plates and shapes, and to extrude special sections.

The typical mechanical properties of aluminum alloy 14S-T are:

Ultimate tensile strength	70,000 psi
Tensile yield strength (set = 0.2%)	60,000 psi
Elongation in 2 in. (1/2-in. dia spec.)	13%
Brinell hardness (500-kg load, 10-mm ball)	135
Shearing strength	42,000 psi
Modulus of elasticity	10,600,000 psi
Minimum guaranteed yield strength (plates and shapes)	50,000 psi

The average coefficient of thermal expansion in the temperature range from −50 deg F to +150 deg F is 0.0000125 per deg F, and the weight is 174 lb per cu ft. Strength and ductility increase slightly at low temperatures.

The natural resistance to corrosion of 14S-T plate is increased by the process known as alcladding. In this process a layer, about 5% of the thickness of the finished plate, of a different aluminum alloy, is rolled onto both surfaces. This surface layer has a chemical composition selected to protect the core metal by causing a slight flow of current from the coating to the core when the coating is cut or broken, and the plate is wet with a conducting liquid such as salt water. By the nature of the action, protection is also provided to contacting parts such as shapes or rivets.

Rivets used were principally 7/8-in.-dia aluminum alloy A17S-T with a few of alloy 53S-W. Where rivets were accessible for driving with a squeeze-type riveter, A17S-T rivets were driven at room temperature, providing an ultimate shearing strength of about 33,000 psi. Wherever pneumatic hammers were necessary, 53S-W rivets were driven at heat-treating temperatures. These hot rivets can be headed up readily and give an ultimate shearing strength of about 24,000 psi.

For the aluminum design, the general basis used was the "Design Specifications for Bridges and Structures of Aluminum Alloy 27S-T," prepared by the late Leon S. Moisseiff, M. ASCE, and published by the Aluminum Co. of America, 1940 edition. Consideration was also given to the specifications and studies prepared by Shortridge Hardesty, M. ASCE, in 1935, in connection with a study for a 544-ft vertical lift span for the Aluminum Co. of America. As far as the Grasse River span was concerned, these specifications did not differ in essential respects from those of Moisseiff. Comparisons were also made with the requirements of the AREA Specifications for Steel Railway Bridges, keeping in mind the differences between steel and alloy 14S-T as regards modulus of elasticity and other physical properties, particularly fatigue strength, which is appreciably lower for aluminum alloys than for steel.

Since the physical properties of alloy 14S-T are higher than those of 27S-T, it was considered permissible to use the specification prepared for alloy 27S-T for this design. The basic unit stress in tension was taken as 21,000 psi, the value used by Moisseiff. Specifications for fabricating the aluminum span were written by B. J. Fletcher, Assoc. M. ASCE, chief engineer, Development Division, Aluminum Co. of America.

Consideration of live-load deflections indicated that the aluminum girder should preferably be deeper than the steel girder. It is evident that, if the live-load unit stresses are the same for the aluminum girder and the steel girder, then for the same depth the aluminum girder will deflect approximately 2.8 times as much as the steel girder on account of its lower modulus. There are two ways to reduce the live-load deflection in the aluminum girder, either by increasing its depth or by decreasing the live-load unit stress. There is a limit to the amount that the depth can be increased, and an appreciable reduction of the unit stress would not be practicable on account of the increased cost.

Steel railway bridge specifications set up certain limiting ratios of depth to span length, which automatically limit deflections. These limits are more or less arbitrary, and there is little definite information on the subject. Specifications usually permit the same depth-span ratios for alloy steels as for carbon steel, although the deflections are appreciably greater for the former. The Grasse River spans will afford an opportunity for comparisons.

On account of the low modulus of elasticity of aluminum alloys, working stresses for columns, web plates, and other parts subject to buckling must have special attention. This means either that width-thickness and l/r values for aluminum alloys must be less than corresponding values for steel, or else that lower unit stresses must be used. The design specifications for aluminum alloy provide properly for this requirement.

Since the steel spans at both ends of the aluminum span had been made 9 ft deep, it was thought that, considering appearance, the maximum depth that should be used for the aluminum alloy girder was about 10 ft. There is a considerable range of depths for plate girders over which the variation in weight of material is found to be small. The depth of 10 ft, while somewhat greater than that which would give maximum economy of material, is still in the economical range, and was selected because of its advantages in reducing deflections.

In the Grasse River span no reversal of stress occurs in principal members. Where such reversal does occur in aluminum alloy structures,

special consideration must be given to this point, on account of the differences between the fatigue characteristics of aluminum alloys and structural steels.

At the time the design was started, heavy plate of alclad 14S-T had never been produced in widths as great as 120 in. As a test the Aluminum Co. rolled several such plates $^3/_4$ in. thick by 120 in. wide by about 26 ft long, and demonstrated that they would have satisfactory physical properties and flatness. Three vertical web splices were used in order not to exceed the 26-ft length for these plates.

In selecting the thickness of the web plate, it was necessary to decide whether to employ longitudinal stiffeners. Under the specifications used, a 120-in. web plate with a unit fiber stress at the toe of the compression flange angle of approximately 14,200 psi, and a unit shear stress of 1,000 psi, would require a thickness of 1 in. With one longitudinal stiffener the thickness required would be 0.47 in. It was decided that only partial advantage should be taken of the use of a longitudinal stiffener, and a 120 by $^3/_4$-in. web plate with one longitudinal stiffener was adopted. The specifications indicate that the longitudinal stiffener angle should be 22 in. from the toe of the flange angle; and that the required radius of gyration of the stiffener angle is 1.6 in. A $5\times3^1/_2\times^3/_8$-in. angle, cut at the vertical stiffeners, was used. Each flange consisted of two angles $8\times6\times^5/_8$ in., and two cover plates $14\times^5/_8$ in. Design features of the girder section are given in Table I.

With a unit shearing stress of 4,100 psi and a $^3/_4$-in. web plate, the specifications give 76 in. as the allowable spacing for intermediate stiffeners. Two angles $5\times3^1/_2\times^7/_{16}$ in., spaced approximately at 6-ft centers, were used for all intermediate stiffeners. The relatively narrow flange, 14 in. wide, was used to minimize any concentration of load at the edge of the flange due to the bending of the ties.

For the top lateral system the diagonals were T-sections 8 in.$\times$6 in. $\times$11.6 lb, having an l/r of 72, and the struts were 6-in.$\times$4-in.$\times$4.9-lb T's with an l/r of 75. The lower lateral system has diagonals of 6-in. $\times$4-in.$\times$3.96-lb T's with an l/r of 96, and struts of 6-in.$\times$4-in.$\times$3.96-lb T's with an l/r of 80.

In the end cross frames the top struts are two angles $5\times3^1/_2\times^9/_{16}$ in., the bottom struts are two angles $4\times3\times^3/_8$-in., and the diagonals are each composed of two T-sections 6 in.$\times$3 in.$\times$ 3.34 lb. Seven equally spaced intermediate cross frames are used, the top struts being one T-section 6 in.$\times$4 in.$\times$4.9 lb, the lower strut one T-section 6 in.$\times$4 in.$\times$3.96 lb., and each diagonal one T-section 6 in.$\times$4 in.$\times$3.96 lb.

Under the design live load of E-60, the live-load deflection of the aluminum span would be 2.16 in. and that of the steel span 0.77 in. Using the probable maximum live loading, which consists of 70-ton freight cars, the maximum dead plus live plus impact bending stresses in the aluminum girders will be 12,500 psi in tension and 10,000 psi in compression. The live-load deflection for this probable loading will be 1.25 in. for the aluminum span and 0.45 in. for the steel span.

The aluminum girder was built with a camber of $1^1/_4$ in. at the center. The shipping weight of the aluminum span was 53,000 lb, and that of a 100-ft steel span was 128,000 lb.

PAINT TESTS MADE

A priming coat of zinc chromate paint, followed by two coats of aluminum paint, was used in painting the aluminum span. The inherent resistance to corrosion of aluminum alloys is so high that there is a good possibility that aluminum structures can be left unpainted in certain exposures. To get additional information on this point, a section of one girder was left unpainted, as can be seen in the photograph, page 530, and this area will be examined periodically to determine its condition.

In addition to the paint system described above, all contacting surfaces were primed before assembly with the

(*Continued on page 567*)

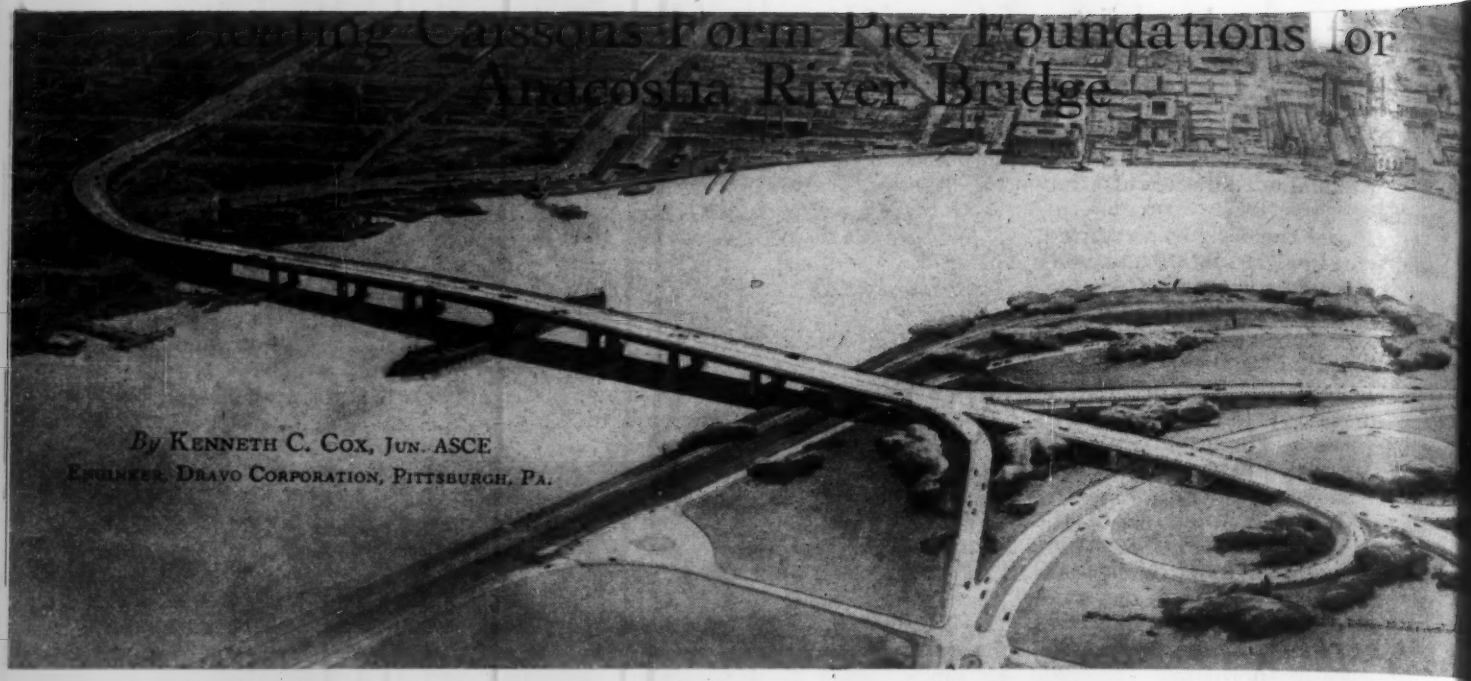
Helicopter Speeds Sampling of Lake Erie Water

WATER SAMPLES from several points 1 to 2 miles off the shore of Lake Erie are collected in a matter of minutes by helicopter for tests by the Western New York Water Co. at its Woodlawn pumping station.

Thus a routine mission which takes as long as $2^1/_4$ hours by boat, weather permitting, is performed with 100 percent efficiency under all weather conditions. The water tests were made in connection with the company's engineering study to extend its water intake from the present location of 4,000 ft offshore to a point farther out.

In the photograph (below, left) a Bell Aircraft Model 47 coupé-type helicopter hovers a few feet above the surface of Lake Erie as water samples are taken. The view at right shows the water samples being emptied into a jar to be taken to a laboratory for testing.

Floating Caissons Form Pier Foundations for Anacostia River Bridge



By KENNETH C. COX, JUN. ASCE
ENGINEER, DRAVO CORPORATION, PITTSBURGH, PA.

SOUTH CAPITOL STREET BRIDGE over Anacostia River, Washington, D.C., is access to District for residents of new housing developments on southern shores of Potomac and Anacostia rivers. In preliminary design shown here, District of Columbia end of crossing begins at intersection of South Capitol and O streets where approach ramp extends south to P Street, at which point bridge swings southeast and crosses river normal to flow. On south side of river, bridge diverges into three ramps.

WORK on the South Capitol Street Bridge over the Anacostia River in Washington, D.C., commenced on December 3, 1945, when a contract for approximately $2,500,000, covering all foundation work, was awarded to Dravo Corporation of Pittsburgh, Pa. This work is expected to be completed by late spring or early summer of 1947. Approach work was sublet to the Leo Butler Co., Silver Spring, Md. Design details for both foundations and superstructure were prepared by Modjeski & Masters, consulting engineers, Harrisburg, Pa. Supervising the project for the District of Columbia are H. C. Whitehurst, director of highways, and C. R. Whyte, engineer of bridges. Representing the District at the site is A. B. Greene, resident engineer.

A TREMENDOUS POPULATION INCREASE in our nation's capital has been witnessed in recent years. To help accommodate this large influx of people, extensive residential developments have been constructed on the southern shores of the Potomac and Anacostia rivers. Travel to and from the District of Columbia by residents of these developments is over a limited number of bridges which are crowded to capacity many hours of the day.

To alleviate this condition—in line with the District government's advance planning—a span across the Anacostia River at South Capitol Street was designed and detailed in 1943, but the pressure of wartime activity made it impossible to proceed with construction at that time.

On the District side of the river, the approach structure is supported by spread footings. The Anacostia approach is supported by fluted steel pile shells filled with concrete and reinforced with steel. Nine caisson foundations make up the 1,300-ft crossing from shore to shore. To accommodate river traffic to the Navy Yard, the center pier will support a swing span which will rotate through a radius of 193 ft.

For identification of the nine caissons—sinking operations of which are described herein—the piers are lettered from the north bank to the south, see photograph above. Identical floating caissons used to sink Piers B, C, D, F, G, and H had a width of 22 ft, a length of 77 ft and when floated into position, a depth of 16 ft. They were designed at Dravo Corporation's Neville Island office, near Pittsburgh, Pa., to withstand stresses introduced by sinking the caissons through water, mud, clay, sand, and gravel.

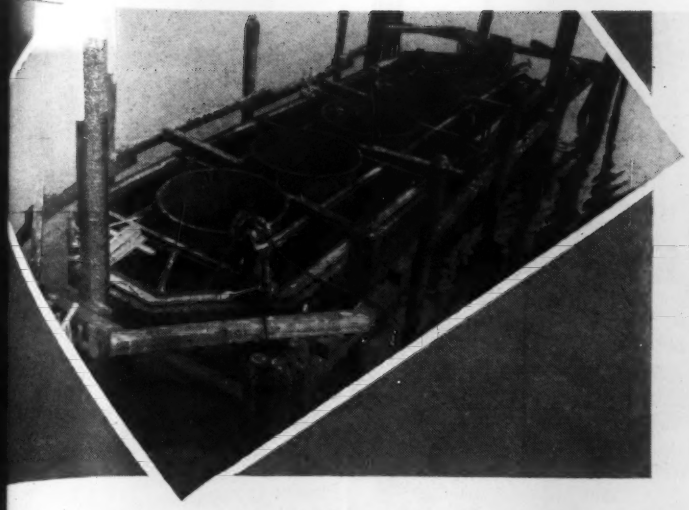
The box-like floating caissons are partially open at the bottom. At the cutting edge, or lower perimeter of the caisson, the outside steel shell extends vertically 16 ft. The bottom or inner wall extends from the cutting edge perimeter at an angle of approximately 45 deg to a deck or work chamber roof 6 ft above. Through this deck run five 10-ft-dia tubes or holes which extend about 2 ft higher than the outer shell.

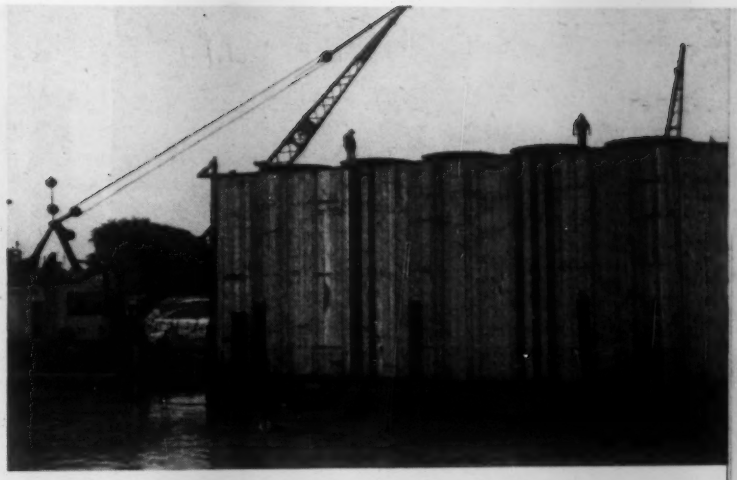
The space between the outer steel skin and the inner wall, made up by the sloping sides, the deck and the tubes, furnished adequate displacement to float the caisson with about 5-ft 9-in. draft. The steel "floater" in this form weighed approximately 80 tons when towed from Dravo Corporation's boat yard at Wilmington, Del., where it was assembled from steel fabricated at Neville Island, Pittsburgh, Pa. At Wilmington the floaters were launched in a manner similar to that used in side-launching ships.

TOWED TO SITE

Each floater was towed from Wilmington, down the Christiana River to the Delaware River, through the Chesapeake and Delaware Canal to Chesapeake Bay, then down the Chesapeake Bay to the mouth of the Potomac River and finally up the Potomac and Anacostia rivers to the construction site where a previously prepared stall positioned it for sinking.

The stall consisted of four five-pile clusters, one cluster in each of the four corners of the stall connected by 12 × 12-in. timbers, with three intermediate supporting piles on each of the two long sides. Across each of the four corners of the stall a 12 × 12-in. stiffening brace was placed. The stall protected the floater from accidental ramming by barges and derrick boats. It also furnished substantial mooring facilities while the caisson was sunk into position.





CAISSON MOORED within previously prepared stall (left) is sunk by 5 ft of poured concrete prior to adding cofferdam (right) of 6 × 12-in. splined joint timber sheeting laid vertically.

Six 24-in. wide-flange beams weighing 100 lb per lin ft were driven within the stall to accurately guide the caisson to the river bottom. Because the care with which they were driven was a major factor in founding the caisson accurately, the guide beams were located with precision. Two of the 24-in. beams were placed on each of the caisson's long sides and one beam at each end. One end of the stall and one of the beams were necessarily placed after the caisson was floated into the stall.

LOCATED BY TRIANGULATION

Stall and guide beams were located by triangulation from two established points on a base line located on the Anacostia shore. After the floater was moored within the stall and the stall was completely closed, the floater was able to move 1 in. in any direction from plan location. This 1 in. of play between the floater and the guide beams was used to permit the caisson some movement within the guide beams as it sank.

After the floater was moored, concrete ballast was poured into it, causing it to sink until there remained about 5 ft of freeboard. The amount of ballast was carefully controlled to provide sufficient freeboard to allow for the additional weight of an attached cofferdam and extensions to the five 10-ft-dia dredge tubes.

On all the floating caissons the same general type of attached cofferdam was used, constructed of 6 × 12-in. splined joint timber sheeting laid vertically. These pieces were assembled in panels of five members each, held together by spiking four 2 × 8-in. battens on the inside. Internal bracing was fabricated from structural steel sections. Carriage bolts fastened the timber sheeting to steel bracing sets. Calking cotton was placed between all sheeting members and all other joints that might leak.

The attached cofferdam formed an extension to the outer shell of the floater and the 10-ft-dia tubes, made of $^{3}/_{16}$-in. thick plates, extended the inner walls. Following the construction of the first attached cofferdam, concrete was added which caused the pier to sink until it rested on the river bottom. Concrete pours were then made in lifts of approximately 10 ft. Each pour was followed by excavating material from within the caisson through the dredge tubes by means of $1^{1}/_{2}$-cu yd clamshell buckets, the caisson sinking as material was removed. This procedure—alternating concreting and excavating—was repeated as design or sinking conditions demanded.

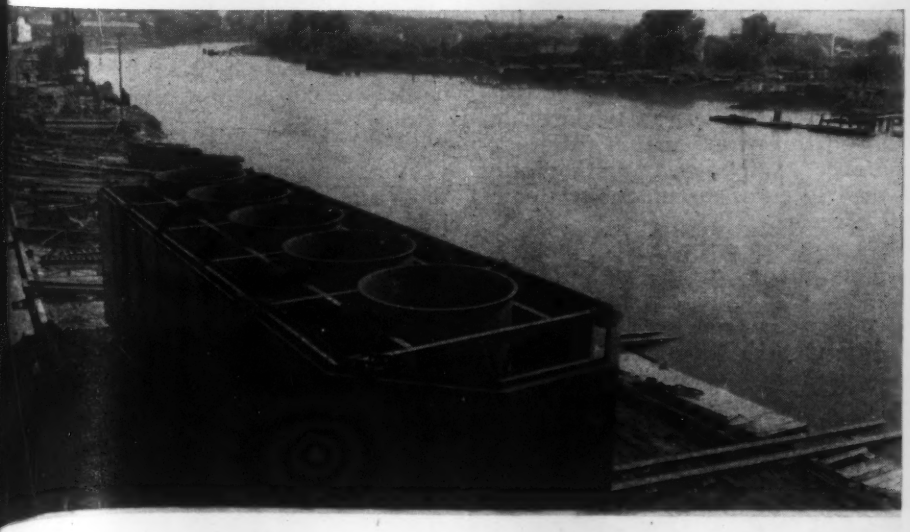
The sinking procedure was interrupted when the freeboard of the first attached cofferdam was reduced to a safe limit. A second attached cofferdam, identical with the first in construction, was then added and the sinking operations were continued. The depth of each cofferdam was 23 to 36 ft, depending on the depth to which the caisson was to be sunk.

CAISSONS ACCURATELY POSITIONED

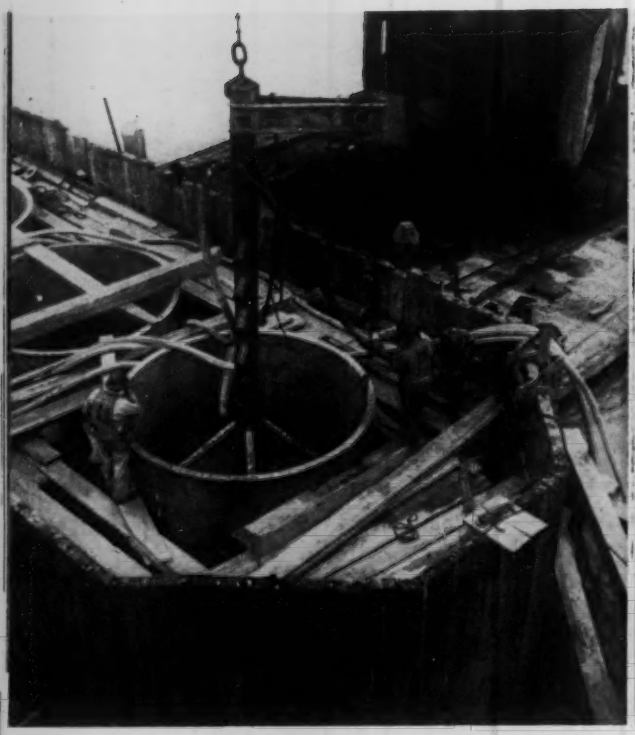
Specifications required that the caissons be sunk to their final position so that the tops or bottoms of the finished caisson, when founded, would not vary more than 12 in. in any direction from their correct horizontal position, nor should the center line of the caisson be inclined from the vertical in its total height more than 18 in. Actually, all the piers founded thus far have been positioned well within these requirements.

Many methods were used to determine position of the caissons as the sinking progressed. Position of the river piers was customarily determined by triangulation. At the top of each caisson at a known distance from the cutting edge, two 24 × 24-in. platforms were installed. One platform was placed at the extreme upstream end of the caisson and centered over the end of the caisson on its longitudinal axis; the other platform was similarly located at the downstream end. The axes of the caisson were projected by measuring diagonals on the sides and ends of the caisson, up from the plane of the cutting edge.

Thus even if the caisson itself were not exactly true to measurement, vertical planes established from the transverse and longitudinal axes of the cutting edge permitted accurate position measurements with refer-

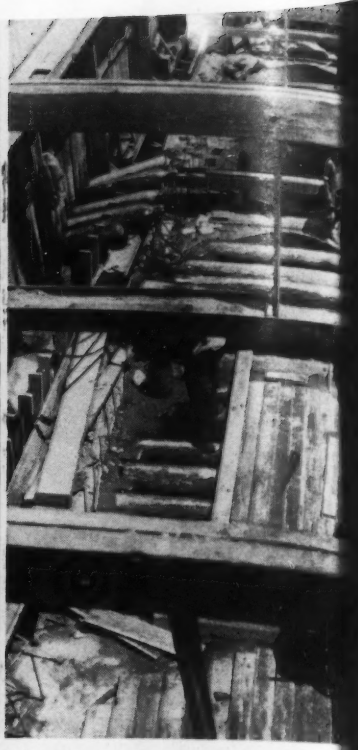


FLOATING CAISSONS USED for foundations of all piers were constructed at Wilmington, Del., and towed to bridge site. Here, completed 80-ton steel "floater" is ready for side launching into river.



CONTROLLED JETTING through dredging tubes cleans inner surfaces and brings caisson to planned elevation. Material jetted from walls and bottom is removed by clamshell bucket.

JOB-DESIGNED TREMIE TOWER equipped with hoist engine is designed to handle tremie hopper and pipe. Tower eliminates need for extra derrick boat and provides safe, fast means for pouring seal.



TOP SECTIONS OF TUBES are removed and dredging wells are covered to support concrete poured within distributing block forms. Average distributing block measures 11½ ft wide, by 14 ft deep by 71 ft long.

ence to the cutting edge. Location readings were made when the caisson was not moving, i.e., when digging was suspended. The theoretical location of the caisson was plotted on each of the 24 × 24-in. platforms by triangulation from points on the base line. Ordinarily, lines of sight were made by observing carefully set targets instead of turning multiple angles. By measuring directly on the platform it was possible to determine how far the plane of the top of the cofferdam was out of location.

INCLINATION DETERMINED

At this point in the sinking procedure it was necessary to know the inclination of the plane of the top of the cofferdam. Ordinarily this was found by taking levels on six headless 30d nails, three of which were located on each of the casisson's longest sides. One nail was located on the center line and the other two on either side at carefully established distances. All nails were located at equal distances measured vertically from the cutting edge. Levels taken on these nails made it possible to determine the amount of lean in the caisson, from which the position of the cutting edge was computed. These observations determined the digging procedure to follow to improve the location of the caisson.

Position of the caisson was observed at least once each day when digging was in progress. Three calibrated gage glasses connected by water hoses were installed vertically and arranged so that the positions of two glasses were parallel to the transverse axis and two were parallel to the longitudinal axis. This arrangement furnished continual information to the excavating crew on the inclination of the plane of the cutting edge and the lean of the cofferdam.

Excavation procedure was such that the cofferdam remained as nearly vertical as possible. Zero of all gages was, of course, equally distant from the cutting edge. The transverse pair of gages were 21 ft apart, the longitudinal gages 28 ft. One gage was common to both the transverse and longitudinal axes. The catenaries of the hoses—suspended only from the gages—eliminated air bubbles which might have destroyed the accuracy of the gages.

JET CLEANS INNER SURFACE

When the caisson was sunk to within 2 ft of its final planned location, the excavating process was stopped and a jet was inserted into the dredging tubes. The jet, particularly developed to operate within the work-chamber walls, was methodically moved to clean the inner surfaces of the caisson.

An 8-in.-dia curved pipe about 13 ft long made up the jet. It was reduced at the tip to a 1½-in.-dia opening. Hinged to a 10-in.-dia vertical header pipe, the top of the jet was able to work through a vertical arc. The length of the vertical header pipe varied with the depth of the caisson and its atttached cofferdams. The length of the header was slightly greater than this total depth. At the top of the header was hinged a 3-in.-dia indicator pipe with the same axial shape as the jet. By an arrangement of sheaves and lines, the indicator pipe and the jet moved in pantograph fashion to show the direction and depth of the jet.

The space below the deck was jetted until all the walls were washed clean and all uneven spots were jetted clear, making a uniform bottom near the cutting-edge elevation. Near the cutting edge undisturbed material was allowed to remain banked against the work-chamber walls. Reduction in amount of this banked material would cause the caisson to sink. Jetting was controlled to bring the caisson to planned elevation after the inner walls were cleaned. All the material washed and jetted from the walls and the bottom was removed carefully with a clamshell bucket, as in the excavating process.

DIVER INSPECTS CAISSON

Final inspection of the caisson bottoms and work chambers was made by a diver. The inspection was usually completed in two or three descents. On each trip to the bottom the diver reported his observations by telephone, stating how much headroom he had, where there were humps, mud or soft material, how far the material was banked against the

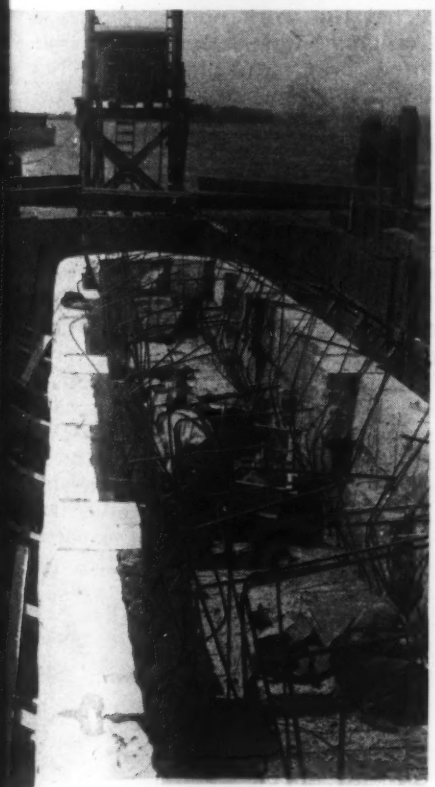
work-chamber walls, and other observations of importance in making the bottom suitable to receive the seal.

To make sure the caissons had no further tendency to sink, they were allowed to rest for a period of 5 days. During this period the caisson was undisturbed except for making observations to see that it had sunk no further. With the assurance that the bottom was clean and that sinking had stopped, the work chambers were filled with concrete to a level of 6 ft above the deck, into each dredging tube. This pour of concrete—known as the "seal"—was placed by means of tremie pipe and hopper since it was placed under water.

DISTRIBUTING BLOCKS POURED

After the seal was poured there was no necessity for the top section of tubes which once formed the inner skin of the cofferdam. These tubes were therefore removed. Forms were constructed over the dredge wells to support concrete poured within distributing block forms built within the attached cofferdam. These blocks, as their name implies, distribute the bridge loads over the top of the caisson. The average reinforced-concrete distributing block measures 11.5 ft wide, 71.0 ft long and 14.0 ft deep. Tops of the distributing blocks were built to El. −5.0 ft.

Granite masonry—some blocks as large as 100 cu ft—was laid atop the distributing block. The masonry was laid two courses at a time and backed with concrete. Granite from Deer Island in Penobscot Bay near Stonington, Me., was used. Each stone bore identifying letters and numbers which designated its final position in the decorative faces of the piers. When the granite facing and its backing had been carried above high tide, the top sections of attached cofferdams were removed. At the top of each pier were embedded the necessary anchor bolts and steel grillages to receive the bridge superstructure.



GRANITE MASONRY for faces of pier is laid atop distributing block two courses at a time and backed with concrete.

LARGE CENTER PIER

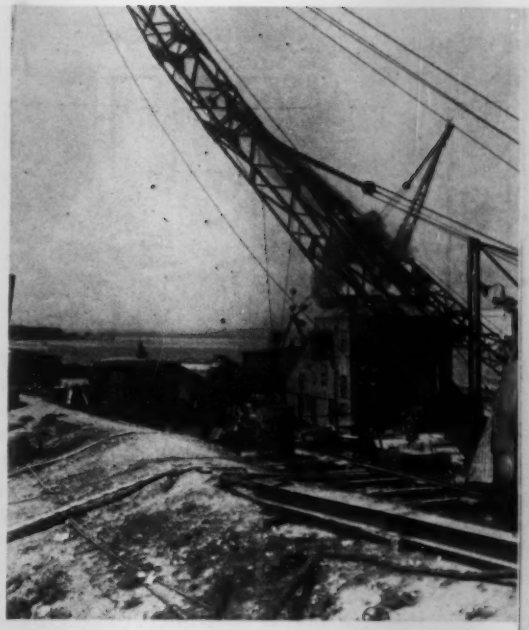
Construction of Pier E followed the same procedure as that used in constructing the caissons previously described. Because of its size, 63 ft square by 20 ft high, the floating caisson for Pier E weighed considerably more than the others, approximately 190 tons. Dredging was done through sixteen 13-ft-dia dredge wells arranged in four rows of four wells each. Three attached cofferdams were used to reach the planned depth of −90.0 ft.

Caissons for Piers A and J, constructed on land, did not require floaters. At the site of Pier A, a layer of river mud about 10 ft deep was removed by dredging, exposing a substantial sand and gravel bottom at El. −9.0 ft. Here, sand fill was placed to build an "island" which was leveled off at El. +5.0 ft, about 3 ft above normal high tide. Pier J, located on the opposite shore, did not require the same site treatment as was needed for Pier A, since suitable clay foundation was available above water level on which to start the caisson.

To start the land caissons for Piers A and J—as contrasted to one of the 80-ton floaters—an 11-ton cutting edge or shoe was used. The shoe was 18 in. deep and was made of steel plates welded together to give a wedge-shaped cross section. The caisson was constructed of reinforced concrete poured within forms, instead of within the walls of a cofferdam as for the river piers. To extend the top of the caisson above high tide, only one short section of attached cofferdam was required; 16 ft deep for Pier A and 10 ft deep for Pier J.

Unusual ground conditions—a hard sandy clay resembling sandstone somewhat—encountered near the founding elevation for Pier J made it possible to dewater this caisson. Because of this material, Pier J was sunk the last few feet by hand mucking "in the open" in the work chamber. Further, it was not necessary to pour the concrete seal under water by the tremie method.

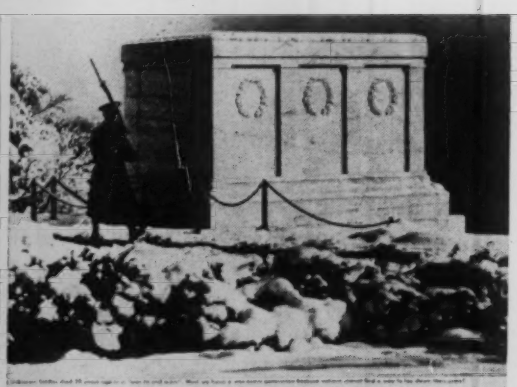
Construction of the nine caissons in the crossing was facilitated by a fleet of Dravo designed and built equipment. Three derrick boats, each mounting a 15-ton Dravo whirler crane with an 85-ft boom, were supplemented by two similar cranes on shore and another as part of a floating mixer plant. The mixer boat contained two 2-cu yd concrete mixers. Sand and gravel were delivered to the floating river plant by barge. Cement delivered by railroad cars in bulk containers was unloaded into a cement barge having a capacity of 2,400 bbl. Each railroad car transported twelve containers carrying a total of about 325 bbl. Containers were handled by a whirler crane and dumped directly into the cement barge. Cement was blown to the batching equipment from the cement barge by a portable blower.



FLOATING MIXER PLANT with two 2-cu yd concrete mixers receives sand, gravel and cement by barge. Cement is blown to batching equipment by portable blower.

All floating derrick boats were powered by steam, the shore whirler cranes by electricity. A four-wire, three-phase, 2,400-v, 60-cycle submarine transmission cable was laid across the river from the Anacostia shore to furnish power to the mixers, a high-pressure pump and compressor boat, welding machines, lighting and power tools. Substations built on pile-supported platforms were available near each pier.

Material was handled at the site on two 26×100-ft by 6-ft 6-in. Dravo steel barges, five 30×130-ft by 7-ft 6-in. Dravo steel barges, and two 20×69-ft by 3-ft 6-in. timber barges. Movement of the equipment at the site was effectively handled by a 125-hp Diesel "pusher-boat" equipped with a Kort nozzle for increased power—also of Dravo design and construction.



Peace on Earth—Dream or Possibility?

Engineers' War Detection Plan Receives National Recognition

"Look" Magazine Features Plan in Lead Article

Malcolm Pirnie Carlton S. Proctor Harry S. Rogers

ASCE MEMBERS FEATURED IN *Look* ARTICLE

AMERICAN ENGINEERS are credited with evolving a "war detection" plan "through which peace might become a real possibility" in the five-page lead article in *Look* magazine's Christmas issue, which is scheduled to reach the newsstands December 10. Based on the two major contributions the engineering profession made toward lasting peace—the reports on disarmament of Germany and Japan—the article points out that "Russia endorsed the war detection technique for control of Germany and Japan and was genuinely impressed with the technical and non-political nature of the engineers' work."

Utilizing its well-known photograph-and-drawing technique, *Look* titles the article, "Peace on Earth—Dream or Possibility?" After citing the fact that "the idea of achieving security by building up armed defenses has been disproved again and again by history," the articles declares:

"But peace through automatic detection of arms manufacturing is a new possibility. It is the idea of a group of America's leading engineers. And although not many Americans are aware of it, the plan these engineeers developed is now in effect in Germany and Japan. The engineers' plan is built upon a system of 'war detection' controls. Under the plan a continuing analysis is made of a nation's industry—what materials it uses and in what amounts.

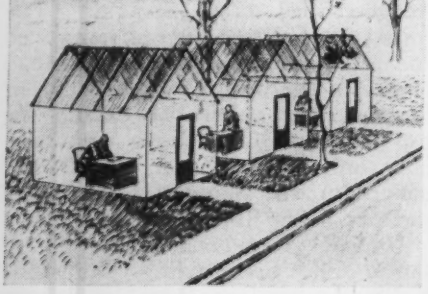
"As the proportion of certain raw materials used varies greatly between peace and war production, any nation changing over to a war footing can be instantly spotted through such an analysis. Advance warning is basic to the plan. Modern war requires long preparation—the war detection analysis would reveal a nation's production for war long before the nation was ready to strike. The engineers feel that their plan would give advance warning of a 1950-style atomic war just as surely as a 1940-style air and ground war."

Photographs of eight members of the engineering profession are part of the story. They were selected by the editors of *Look* as the men who directed the work on the reports on Germany and Japan. Those pictured are: Malcolm Pirnie, New York Past-President, ASCE; Col. Carlton S. Proctor, New York, Past-Director, ASCE; Dr. Harry S. Rogers, Brooklyn, Member, ASCE; Dr. H. Foster Bain, New York, Past-Secretary, AIME; Charles W. E. Clarke, Philadelphia, Fellow, ASME; Sidney D. Kirkpatrick, New York, Past-President, AIChE; R. E. McConnell, New York, Member, AIME; and Dr. R. E. Zimmerman, Pittsburgh, Member AIME. Engineers are aware that the foregoing is only a partial list of those who were responsible for and prominent in preparation of the disarmament reports *Look* also points out that, altogether, more than fifty prominent engineers, representing the five societies, participated.

Copies of the article outlining the plan originated by EJC, composed of the American Society of Civil

IRON CURTAINS MUST GO

Today we are living in a world of secrecy, a world of iron curtains. Not knowing what goes on behind neighboring curtains, each nation must continue to bear arms, and to better them through feverish war research.



The War Detection Plan assumes that the threat of war will never be abolished until secrecy is abolished. The engineers vision is a world of glass houses, a world without secrecy.

Concluding drawings in the LOOK article point out that under the engineers' plan, iron curtains must be replaced by "a world of glass houses," in which all nations have opportunity to observe what the others are doing regarding armaments.

at a time and backed with concrete.

Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Institute of Chemical Engineers, are being sent by *Look* to representatives of the United Nations, in session in New York.

"The controls worked out by the engineers for Germany and Japan," the article states, "specifically prohibit certain types of manufactures. Other products are severely limited. The technique of war detection is included in the program as its long-range safety factor—to reveal automatically any future secret rearmament by the ex-enemy states. *Look* proposes that the war detection technique, now in effect in Germany and Japan, be seriously considered for the whole world."

Asserting that the United Nations, "although far along in its second year, has found no workable basis on which the nations of the world might lay aside their weapons," *Look* declares:

"The Engineers' Plan accepts this situation. Nations are not, as yet, ready to accept an all-powerful 'one-world' government. Yet, presumably, nations are desperately interested in finding a basis for living together in peace. The war detection plan, being voluntary in nature, could be put into effect with the existing machinery of the United Nations. It might provide the long sought 'workable' system of inspection under which nations might safely lay down their arms.

"With detection controls in effect, leading technical men from each nation would work together as observers in all the countries of the world. A continuing watch would be set on each nation to see that it followed quotas permitting unlimited peaceful manufactures, but no arms making. Production changes would be investigated. Such a huge diversion of electric power as occurred in the atomic project would be easily spotted. The plan would provide regular publicity of all findings. If any nation began war preparation the world would be informed automatically. Detection would reveal any nation's return to arms. As rocket-atomic war requires long preparation, the world would be warned in time."

Declaring that under the plan, which contemplates step-by-step disarmament, "distrust would be replaced by the knowledge that no nation was under arms," *Look* states:

"Today we are living in a world of secrecy, a world of iron curtains. Not knowing what goes on behind neighboring curtains, each nation must continue to bear arms—and to improve those arms through feverish war research. The war detection plan assumes that the threat of war will never be abolished until secrecy is abolished. The engineers' vision is a world without secrecy, a world of glass houses.

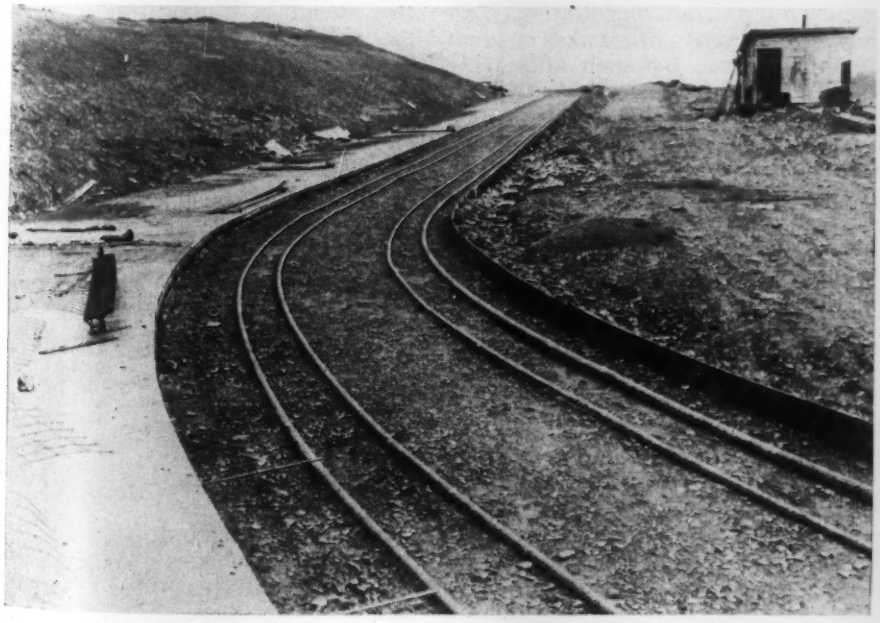
"A panel of leading engineers, under the UN, must analyze each nation's industry, develop the working structure of an international War Detection Plan. The UN, after studying the proposed plan, must so modify it that it will be acceptable to all of the Big 5 powers.

"Once ratified, the plan would go into effect on an agreed upon date, and 'Operation Peace' would begin—the total disarmament of the nations of the world."

Embedded Pipes Solve Roadway Snow and Ice Removal Problem

SNOW REMOVAL on a 600-ft, two-lane roadway, leading into the Bridgeville, Pa., plant of the American Cyanamid Co., is accomplished by a system of hot water pipes embedded in the 24-ft-wide concrete pavement.

The structural principles involved in designing and installing the system are somewhat related to those encountered in radiant heating work. Eight lengths of black wrought-iron pipe placed 18 in. apart beneath each lane provide snow-free, ice-free wheel tracks about 2 or 3 ft wide on a roadway which would be otherwise virtually impassable. Heat transferred from the buried wrought-iron pipes to the concrete warms the pavement sufficiently to melt snow and prevent ice from forming. Residual water is quickly evaporated from the warm surface by natural air currents.



Hot water, at an average temperature of 165 deg F, is circulated through these pipes at approximately 50 gpm against a head of 17 ft. The water is heated by steam from the plant's boilers in a converter used especially for the snow-melting system.

This system of melting snow is one that is being studied with considerable interest by many engineers throughout the country, since the idea of eliminating costly and time-consuming manual snow-removal operations has significant appeal. Frequently, manual snow-removal efforts are ineffective because the snow drifts and falls with such rapidity that as soon as one area is cleared, it quickly becomes covered again. Automatic snow-melting systems do not have to be kept in operation at all times. They can be turned on when snow is predicted—or when snow begins to fall.

Strikes, Boycotts, Closed-Shop Issue Harass West Coast Engineers

By WALTER E. JESSUP, WESTERN REPRESENTATIVE, ASCE

By reading the daily papers and listening to radio commentators, engineers have become aware of the numerous strikes and boycotts that are slowing up our industrial and economic recovery. Less well publicized are strikes, picket lines and boycotts affecting engineers; strikes and picket lines to force engineering employees into unions against their will as a condition of employment; boycotts to force employers of engineers to sign union or closed-shop agreements. This article reports efforts of organized labor in the West to force closed-shop agreements on engineering offices so that "vital construction work in the area will continue without interruption."

A FEW GENERALLY accepted labor relations definitions will be of assistance in obtaining a clearer understanding of the employment conditions issues developing in engineering offices along the Pacific Coast.

A strike is a temporary stoppage of work by a group of employees to express a grievance or to force a demand on their employer concerning changes in working conditions. In a sympathetic strike other workers of the same employer, who are not directly concerned with the matter in dispute, join in the strike to demonstrate workers' solidarity and to broaden the group pressure on the employer against whom there is a strike for a specific grievance. A secondary strike is a strike against an employer who sells or uses materials or services from a struck plant or office. The secondary strike differs from a sympathetic strike in that there is no business connection between the employer involved in the initial strike and the employees waging the secondary strike.

A boycott is another weapon used by organized labor in labor disputes. It is a combination to bring force to bear upon an employer accused of objectionable labor practices by withholding, and by coercing others to withhold, the purchase of goods or services from the employer. It is a conspiracy to injure the business of the person by preventing prospective customers from buying goods from, or employing the services of, the business by threats, intimidation, or other forcible means. In the primary boycott the workers themselves, by concerted action, cease purchasing from or dealing with their employer either socially or in a business way. In the secondary boycott the organized workers of an employer exert coercive pressure on customers and clients so that they, too, withhold or withdraw their patronage from the employer through fear of physical injury or other loss or damage to themselves.

UNIONS, COUNCILS AFFILIATE

Local unions of the American Federation of Labor secure united action in collective bargaining and uniform working conditions among the employers in the construction industry in an area such as a county or city by setting up a Building Trades Council. The Council generally negotiates agreements on behalf of its affiliated building crafts unions with their contractor employers, through the Associated General Contractors. Councils have supreme authority over their affiliated unions in contract negotiations and have sole power to call strikes or sanction boycotts. By such affiliations the Technical Engineers', Architects' & Draftsmens' Union locals of the A. F. of L. obtain added power to enforce demands on professional engineers and contractors employing engineers, through threat that a secondary strike will be called of the affiliated building trades craft union workers unless the engineers comply with A. F. of L. demands.

Local 95 of this A. F. of L. union in Los Angeles (P. G. Ripper, international representative) made a demand on George N. Adams, Assoc. M. ASCE, consulting engineer, in April 1946 to employ only union engineers. Building Trades Council agreements in Los Angeles require that a majority of the employees in a shop or office belong to the union and favor the closed-shop demand before the demand will be recognized by the Council. The required majority was lacking in Mr. Adams' office. The closed-shop demand failed.

In November of 1945, Mr. Nelson, business agent of Local 17, Engineers', Architects' & Draftsmen's Union of A. F. of L., with headquarters in Seattle, presented a closed-shop contract for the signature of Parker & Hill, civil and consulting engineers of Seattle. The demand was backed by the union threat that unless the contract was signed—unless Parker & Hill plans bore the union label—the construction jobs of that firm would be picketed, and allied building crafts union men would not work on them. The professional staff did not favor delegating their bargaining rights to Local 17. Instead, they organized their own collective bargaining unit and designated as their bargaining agent the Seattle Professional Engineering Employees Association (Trygve Hoff, M. ASCE, chairman). A contract between Parker & Hill and the Seattle Professional Engineering Employees Association was signed in April 1946. The threatened boycott has not developed.

Faced with the need for an expansion of its sanitary sewer system, Bremerton, Wash., contemplated engaging the services of a consulting firm to study the problem and make plans for construction. It is reported that members of Local 17 informed the city administration that only a firm having an agreement with the union should be engaged. The threat was implied that unless this was done crafts union workers would boycott the job when it got to the construction stage. Similar demands are reported to have been made on another Washington municipality.

During the spring of 1946, 50 bridge engineers of the Washington State Highway office in Olympia were pressed by union officials to affiliate with Local 17 as a condition of holding their jobs. Most of these professional engineers already were members of the Southwest Washington Association of Professional Engineers (Ronald Knapp, Assoc. M. ASCE, chairman), which organization provides the machinery for collective bargaining for the professional engineers in the state's Olympia office.

They expressed the desire that any collective bargaining required be done for them by their own Association. The pressure to join with Local 17 became so great as to result in telegrams of protest from national and local professional engineering societies to the Governor. Members of SWAPEE met with officers of Local 17 in Seattle on April 25 for the purpose of establishing the jurisdiction of each organization. Local 17 declined to restrict its membership campaign to subprofessional employees of the state. State officials, however, have declined to establish a union closed-shop or to recognize either organization as the sole bargaining representative of the engineers in state employ. These professional engineers so far have successfully resisted being absorbed by the union.

Local 17 makes its goal clear. Mr. Nelson of the Local has stated his intention to attempt to have plans and specifications which are prepared by other than union members—those which do not bear the union label—declared unfair by the Washington State Federation of Labor. The professional engineering societies in Washington will counter this action vigorously and Local 17 has been so informed. The threatened union action has not been taken.

BAY COUNTIES ORGANIZED

Late in 1945, Local 89, Technical Engineers', Architects' & Draftsmens' Union, A. F. of L. with headquarters in Oakland, Calif., started a concerted drive to organize all unorganized engineers to obtain closed-shop agreements with all the engineering and architectural firms in the counties adjacent to San Francisco Bay, and to establish the union wage scale for engineers, architects, surveyors, draftsmen, estimators, computors, and inspectors. The drive was made under the leadership of J. A. Johnson, business representative of Local 89.

The pattern of approach by Local 89 was to present, first, a closed union-shop contract to each engineering firm. The contract provided for: (1) hiring only union engineers furnished by the union; (2) requiring all other non-union engineering employees, or those subsequently employed, to become members of the union as a condition of employment; (3) acceptance of the union's job classification and wage scales; and (4) recognition of the union as the sole collective bargaining agent for all employment conditions between the firm and all of its engineering employees. Most firms had but few employees affiliated with Local 89 and rejected the contract. A few accepted the terms of the union contract and signed.

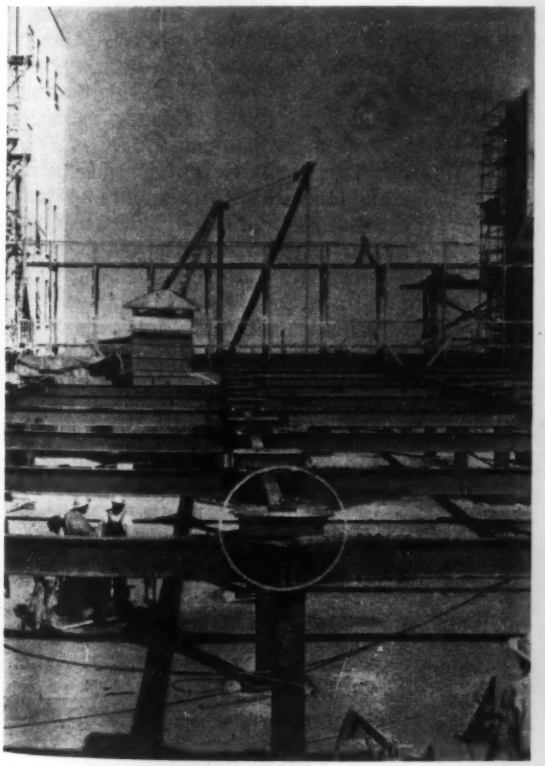
Local 89, affiliated with the Building Trades Councils in the several counties in which it operates, obtained the sanction of the Council in Marin, Alameda, and Contra Costa counties before it called a strike or could get the cooperation of the

(*Continued on page 566*)

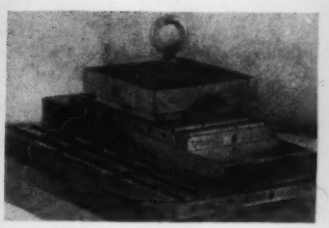
Floating Building Absorbs Earthquake Shock

ANTI-EARTHQUAKE ROLLER BEARINGS, enabling a building to "roll with the punch" of an earth tremor, are being installed in Los Angeles for the first time in construction history to solve a difficult engineering problem.

The bearings, made by the Torrington Co., South Bend, Ind., are being employed to permit addition of three floors to a six-story portion of the Sears, Roebuck & Co. plant built in 1929 before the present building code went into effect. The code requires that all construction be designed to withstand the horizontal stress caused by seismic disturbances. Application of roller bearings under each of the main pillars of the Sears, Roebuck addition avoided the excessive cost and prohibitive disruption of company activities which the strengthening of the old building would have entailed.



ROLLING FOUNDATION (left) for three-story addition to Los Angeles office building is provided by 65 sets of roller bearings, each 21 in. square, designed to carry column loads of 250,000 lb. Assemblies come to job held by bolted clamps to prevent movement until erection is completed.



SPECIALLY DESIGNED ROLLER BEARINGS (below), each weighing 600 lb, permit structure to move anywhere within 12-in.-dia circle to absorb earthquake shock. Steel bearings made by the Torrington Co., South Bend, Ind., are alloy steel, precise in measurement to millionths of an inch.

The part of the building constructed in 1929 will carry only the vertical load from its three-story addition, while an adjoining structure with an 8-in. separation, built in 1940 and conforming to the code, will absorb both the earthquake rockings of its own mass and any shocks suffered by the addition.

The roller bearing assemblies placed between the 1929 building and its new floors will carry the vertical load, and at the same time absorb any horizontal stress. Each of the new floors will also be tied rigidly to the adjoining 1940 building.

As the horizontal plane for the roller bearings, a double system of steel framing is used. A complete structural framing in a horizontal plane just below the roller bearings resists the column eccentricity caused by relative movement of the column center line, and similarly a horizontal framing system supports loads of the floor just above the plane of the roller bearings.

When completed this building will be the first structure ever to be "floated" on roller bearings.

Road Costs Must Be Justified by Savings to Drivers

By JESSE E. WILLIAMS, ASSOC. M. ASCE
DISTRICT ENGINEER, PUBLIC ROADS ADMINISTRATION, SANTA FE, N. MEX.

TWENTY-ONE per cent of the national income was spent on the operation of motor vehicles during 1941—a representative prewar year. This estimate, based on PRA tabulations, covers the cost of 334 billion vehicle-miles of travel at 6 cents per mile. In hard cash that amounts to about 20 billion dollars. With these figures "it's a cinch" for highway construction to show conclusively the economies to be realized with good roads.

True, the cost of construction and operation of highways is relatively small compared to this 20 billion dollars. Yet highway improvements, to be justified economically, must reduce the unit cost of operation.

One of the first problems the engineer must consider in a proposed improvement is the alinement in general—whether to radically relocate it, whether to straighten it, or whether to follow generally the road already in use. The route to be preferred is the one that will save the most to motor vehicle operators in vehicle costs and time values in proportion to the improvement costs, provided other factors, such as accident hazards, are equal. However, the construction is not justified if total road costs exceed the savings to the operators. To arrive at the proper solution of such problems, the engineer must know the traffic volume and the type and characteristics of the traffic that will use the proposed route.

OVER-DESIGN A COMMON ERROR

After it has been determined to improve a road, the economics of total costs of motor vehicle transportation are often overlooked, and as a result the road may be over-designed. The Oregon Highway Department has made a comprehensive study of this problem. It uses two different quotients, one based on solvency, the other on benefit. The solvency quotient is the "revenue" to be derived from road users, divided by the cost of the improvement. The benefit quotient is the savings to motor vehicle operators as a result of the improvement, divided by the cost of the improvement. These two quotients are combined to indicate priority and desirability of improvements. If the road is over-designed, the quotients will indicate the undesirability of construction.

How much stress should be placed on a solvency quotient is a question that is deserving of much more study. The fact that a road will not "earn" in road-user revenues sufficient funds to pay for the construction cannot by itself be the basis for refusing improvement, as then only the main roads would be constructed, and even they might not be justified if the less important roads, which act as feeders to them, are not improved. Of course the road systems as a whole must be solvent, in the sense that the "earnings" in terms of revenues from all sources must be sufficient to maintain and perpetuate the existing highway plant, and to carry the charges on the highway debt, if any.

Minimum design standards to be used are as a rule based on traffic volumes, so actually the economic justification of benefits to traffic has been considered. But maximum design standards have not been established; therefore it is essential that the highway engineer consider the economic aspects in order to avoid over-design.

DESIGN STANDARDS NO SOLUTION

The establishment of minimum design standards on a road does not relieve the designer of further consideration of economic problems. For example, it may be possible to decrease construction costs by lengthening the road. The decision as to the line to be selected normally is based on a comparison between the various possible locations for benefits to traffic against costs of construction and operation.

Highway maintenance costs should not be overlooked. They sometimes are the determining factor in reaching a decision. For example, a shorter location under consideration may contain more cut-and-fill sections than a longer location, with resulting higher maintenance costs. In such a case this difference may justify the longer line. In addition to maintenance costs, the economic value of several other items should be considered in designing a specific project:

1. Design speed, particularly in its effects on time values to operators.
2. Alinement in its effects on distances to be traveled.
3. Curvature, grades, and surface type in their effects on operating costs.

BEFORE ROAD BUILDING EQUIPMENT STARTS TO WORK, POTENTIAL SAVINGS TO MOTORISTS MUST BE ASSURED

4. Roadway width, surface color, freedom from dust, and sight distance in their effects on both time of travel and safety.

5. Controlled access in its effects on safety, freedom from congestion, and particularly length of life of the project.

6. Intersection design, stop signs, number of lanes, and separation of grades in their effect on safety, time values, and vehicle operation costs.

Extensive studies of the effects of various design features on the operating costs of motor vehicles have been made by Prof. Ralph A. Moyer, Assoc. M. ASCE, of Iowa State College. In a study of 293 mail carrier cars he determined that it cost 0.85 cent more per mile to operate a car on a gravel surface than on pavement, and 0.35 cent more per mile on an earth surface than on gravel. On this basis, the benefit per year in vehicle operating costs alone resulting from replacement of a gravel surface with pavement was found to be $3.10 per mile per vehicle.

He concluded that a low type of oil surface was justified on a road carrying 50 vehicles per day. It should be noted that road-user tolls in New Mexico were reported to be 0.441 cent per vehicle-mile in 1941. On that basis the "earnings" would be about $80 per year per mile on a road with a traffic volume of 50 vehicles per day. Assuming a life of 20 years for the road, there would be only $1,600 per mile available for construction and maintenance from the tolls on the users of the road.

In other words, as the tolls from the users are not sufficient to construct the road, it would be necessary to subsidize it from tolls collected on other roads. Subsidies may be desirable; however, highway administrators should be aware in each case that the road by itself is not "earning" its way. It is doubtful whether many state highway departments have sufficient excess "earnings" from their main highways to be able to finance the improvement to an oil surface of all roads in the state carrying 50 vehicles per day or more. State highway engineers should determine the minimum traffic volumes on which they can afford to construct the various surface types. For each agency this will vary, depending on construction costs and road-user fees. Determination of such problems is one of the primary objectives of the Highway Planning Surveys.

Many detailed studies of the operating costs of motor vehicles have been made and figures are available. The costs of operation have steadily decreased with improvements in vehicles. As this trend will probably continue, the engineer should be conservative when using operating-cost figures. It should be noted that in computing savings in distance, only the costs that vary with distance should be used—namely, gasoline, oil, tires, and maintenance. Certainly there is no saving realized in such items as license fees and similar annual-cost items, by a small reduction in miles driven.

COMPUTING TOTAL BENEFITS

After a computation of benefits to motor vehicle operators resulting from a proposed improvement, a common procedure is to capitalize the annual benefits and then consider this as the amount that is justified for construction. The life of the road is obscured by such a method; also possible increases in traffic volume may be ignored and annual maintenance costs may not be included. A preferable method is to compare the computed total benefits accruing during the estimated life of the road with the total estimated cost of construction and maintenance during the same period.

The effect of road construction on established business interests does not directly affect transportation costs, but it cannot be ignored. Whenever the location of a road is changed, a property owner is involved in the improvements along both the old and the new route, and he may be benefited or harmed depending on individual conditions. The harm to a few should not be permitted to prevent benefit to the many, but it certainly must be considered. The courts have consistently held that established business interests have no vested right to the benefit of patronage from traffic using a road. If they did, improvement of highways for the benefit of road users (who are the ones who must pay for the improvement) would be seriously curtailed.

The highway engineer should not overlook the fact that filling stations, garages, hotels and tourist courts, restaurants and similar facilities are an essential part of the transportation industry and must be considered in any economic analysis. But the development of these commercial facilities must be orderly, so that highway travel will not be discouraged because of the resulting inefficiencies of the haphazard arrangement of land uses adjacent to the road. Many of these problems can be overcome by constructing highways with controlled access.

GOOD ALINEMENT (ON U.S. 70 IN NEW MEXICO) MEANS SAVINGS TO MOTOR VEHICLE OPERATORS

IN RURAL RUTS OPERATING COSTS MOUNT

COMMERCIAL "FRINGE" ALONG HIGHWAY HAS NO VESTED RIGHT IN ROUTE'S LOCATION

Underpinning Features Commercial Building Construction

By JOSEPH C. WEAVER

GENERAL SUPERINTENDENT, SPENCER, WHITE AND PRENTIS, INC., NEW YORK, N.Y.

PROVISION of a new heating plant for a commercial building in Newark, N.J., required excavation under existing structures and extensive underpinning of heavy loads. For support of a 700-ton stack, concrete cylinders were jacked into place as the stack was constructed.

CRAMPED quarters and inadequate foundation soils combined to provide a challenging job for the contractors on a heating plant in downtown Newark, N.J. Surrounded on all sides by commercial buildings, the site could be reached only through the narrow alley which was itself within the area to be excavated. Construction of the foundations for the new structure within the area, and underpinning of adjacent buildings, therefore required considerable ingenuity.

HEATING PLANT NEEDED FIRST

The heating plant is the first element of a new three-story building occupying a strategically located shopping corner (Fig. 1). The entire structure could not be completed because of wartime restrictions on the use of materials. However, it was essential to complete the heating plant so that the existing buildings could be heated and occupied until such time as the entire project could be finished.

The boiler-room floor was approximately 20 ft below the area, necessitating the carrying down of the foundations of the adjacent Beck Shoe Store building an additional 10 ft. This underpinning was placed in alternate pits sheeted with horizontal louvre boards. Sections of the new boiler-room wall, paralleling the underpinning, were poured simultaneously in the same pits, with 1 × 6-in. boards partially separating the two. This provided a double wall thickness against lateral movement. Provision is thus made for demolition of the underpinning of the Beck Store wall, if such procedure is ever necessary, without disturbing the boiler-room wall.

When the east wall of the boiler and coal rooms was placed, gaps were left for future columns of the new building. These gaps were temporarily filled with brick, to be removed when the future building is erected. This wall was also actually an underpinning of the existing building's foundations.

Design of the heating plant called for a brick stack 200 ft high above its base, extending above the 10-story Prudential Building alongside. The dead weight of this stack, including the foundation mat, was 695 tons. Wind load on the stack brought the total load to 995 tons. The soil at the elevation of the bottom of the stack mat was a medium sand containing little clay or other inferior materials. As far as the dead weight of the stack was concerned, less than $1^1/_2$ tons per sq ft was imposed on the soil. The sand was considered entirely adequate for this load, but it was reasoned that the shifting of the center of gravity from side to side due to wind load would cause a progressive settlement, which would have an adverse effect on adjacent buildings. The solution was the installation of 20 Pretest cylinders around the rim of the mat. Six of these resisted the wind from any direction. In other words, as the center of gravity of the stack moved with the force of the wind, the additional load would be absorbed by the cylinders on the overloaded side.

Installation of the load-bearing cylinders was an unusual operation. On three sides of the stack mat, the cylinders could be jacked into place as soon as the stack reached a height (and weight) to provide the necessary reaction. On the fourth side, however, the mat edge was inaccessible because of the adjacent Prudential Building wall and underpinning. Thus, the first step in the process was to install the cylinders under the Prudential wall to carry both the wall and the stack mat. The wall therefore provided the the reaction for these stack cylinders.

CYLINDERS JACKED INTO PLACE

Next, the stack mat was placed and then the short lengths of cylinders located under the three remaining edges, with space for jacking opera-

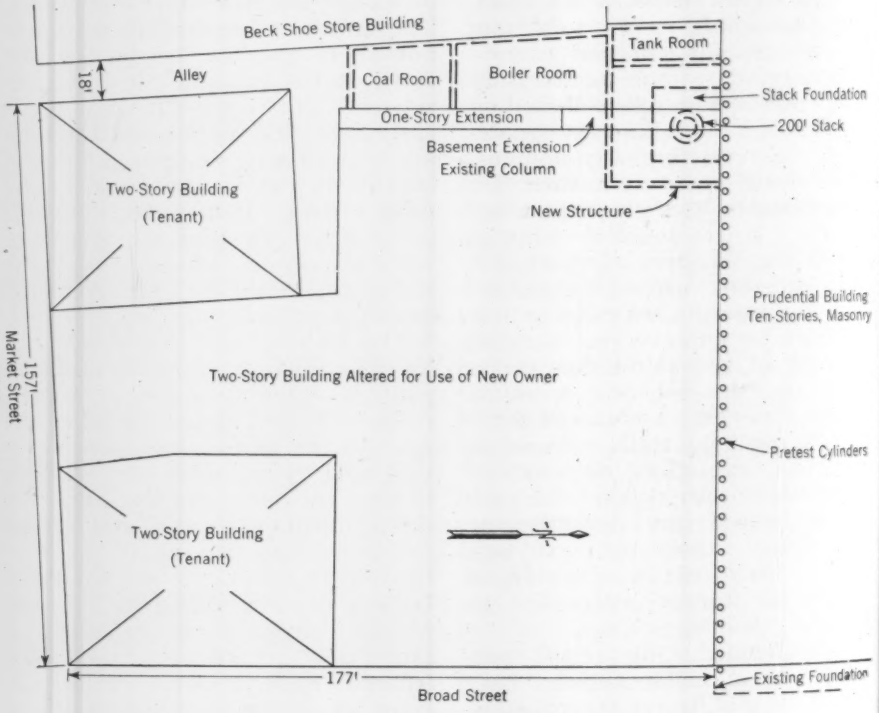
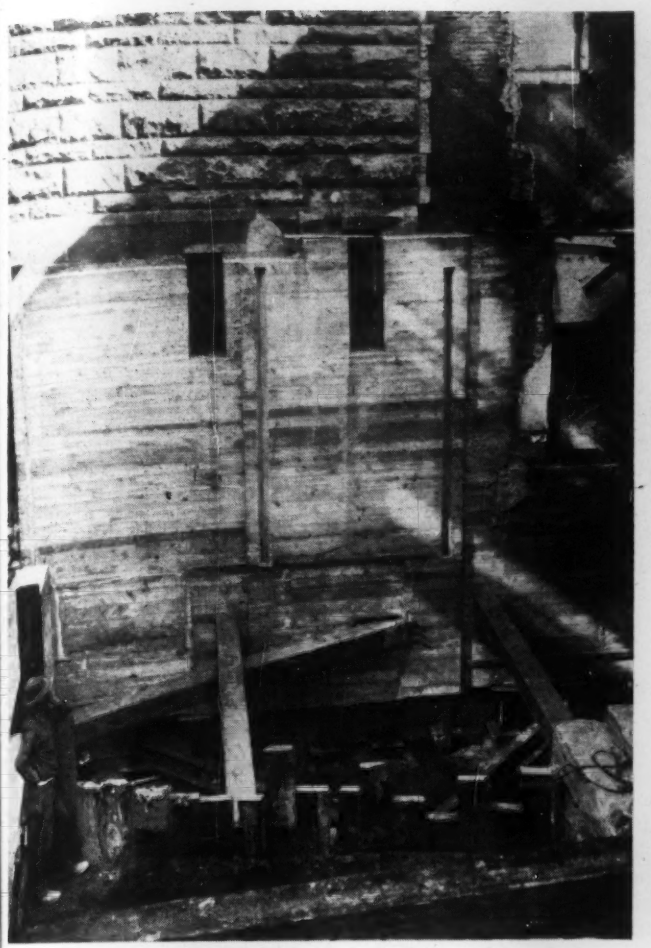
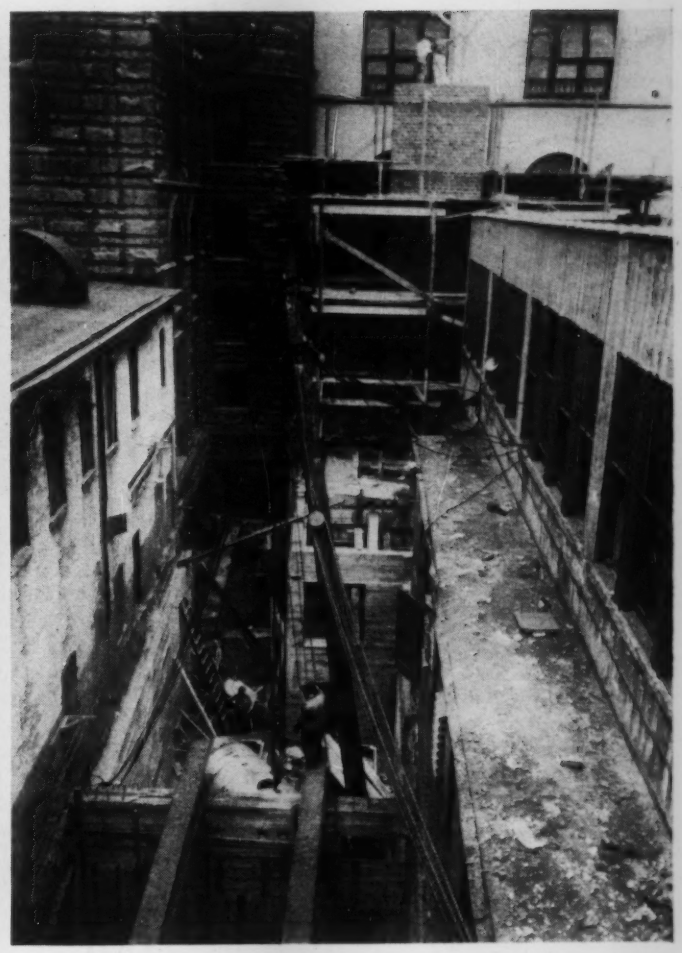


FIG. 1. SITE OF HEATING PLANT



SECTION OF UNDERPINNING FOR PRUDENTIAL BUILDING WALL—NOTE SPACE AT BOTTOM FOR STACK MAT TO BE PLACED ON PRETEST CYLINDERS



CLOSE QUARTERS FOR CONSTRUCTION OF HEATING PLANT UNDER EXISTING BUILDINGS, WHERE CRANE CLEARED ALLEY WALLS BY INCHES

tions. Then as the stack grew, one after another of the cylinders was jacked into place and the load of the stack was transferred to them.

The stack mat consisted of a concrete slab approximately 20 by 20, by 5 ft 6 in. thick. To avoid the use of critical materials, the mat was reinforced with steel beams recovered from the demolition of the part of the existing building that interfered with the stack construction. These beams were set radially, generally above the Pretest cylinders, and provided strength in excess of that of a conventionally reinforced slab.

EAST AND WEST WALLS PLACED

Another interesting feature was the installation of the east and west walls of the stack area. The west side wall was carried about 13 ft below the foundations of a wing of the Prudential Building, and only 10 ft away. The character of the soil permitted excavation for the new wall without underpinning the Prudential wall, provided care was used and only short sections were opened at any one time. The wall and its supporting cylinders were therefore constructed in pits. After all sections of the wall were in place, the cylinders were jacked down into place to carry the new building when it can be completed.

SOME UNDERPINNING REQUIRED

Seven of the existing building columns located close to the new construction required underpinning. One of these columns, close to the mat, had to be carried down about 14 ft. The entire load of this column was transferred to shoring, and a concrete pier constructed of the required depth, after which the shoring was removed. The remaining columns, which were only a few feet from the boiler room, were carried down about 10 ft by means of Pretest cylinders jacked directly below the footing.

Excavation for the boiler room was done with a truck crane equipped with a clamshell bucket. The crane cleared the alley walls by inches only, so that extreme care in operation was necessary. Excavated material was trucked away from the site. Materials were brought in through the alley and stored in a section of the store building. Concrete for the foundation, walls, and cylinders was brought to the job in Ready-Mix trucks and chuted directly into forms wherever possible. The shells for the Pretest cylinders were from stock left over from the Sixth Avenue Subway job completed in 1940. Shortage of new materials forced their use but they were entirely satisfactory.

Architect for the owner was A. F. Winter, while the representative of the Prudential Insurance Company was R. A. Backus. The general contractor was Nicholas W. D'Elia, Inc. The foundation work described in this article was performed by Spencer, White and Prentis, Inc., on a subcontract under the supervision of Mario Canale, Superintendent, and the author, General Superintendent.

Induced Infiltration Supplies Most Productive Well Field

Wabash River Infiltration Pumped from Large-Capacity Horizontal Water Collectors

By RAPHAEL G. KAZMANN, Assoc. M. ASCE

HYDROLOGIC ENGINEER IN CHARGE OF INVESTIGATION AND RESEARCH, RANNEY METHOD WATER SUPPLIES, INC., COLUMBUS, OHIO

THE Wabash River Ordnance Works owns what is probably the most productive well field in the country, and possibly in the world. Located in southwestern Indiana, on the bank of the Wabash River, the field consists of six Ranney-type wells, or water collectors, spaced at approximately 2,000-ft intervals. During the 24-month period that the Ordnance Works was in full operation (August 1943 through July 1945), the field yielded an average of 72,000,000 gal a day, equivalent to 12 mgd per collector. In terms of water production, the peak month was October 1943, when an average of 84.2 mgd was pumped. The peak day was September 28, 1943, when 88,695,000 gal was pumped.

The collector field is located on a broad terrace of the Wabash River about three miles south of Newport and thirty miles north of Terre Haute, Ind. The collectors tap a very productive aquifer composed of sand, gravel, and boulders with a total thickness of about 100 ft. On the basis of available drawdown, at the peak production rate of almost 89,000,000 gal a day from the six units, there remained an unused capacity in the collector field of at least 50%. During the entire period of operation only one collector was ever pumped at its maximum available drawdown, at which time it yielded more than 12,500 gal a minute, or 18,000,000 gal a day.

Collector No. 2 of the Wabash River Ordnance Works is representative of the field. It is a typical collector consisting of a reinforced concrete caisson 13 ft in inside diameter and 16 ft in outside diameter. (See Fig. 1.) The bottom of the caisson is at El. 408.3, and there are two tiers of portholes at Els. 410.6 and 414.1. A total of 1,700 ft of 8-in. slotted well-casing, having 0.38 sq ft of openings per linear foot, has been projected from the portholes in lengths ranging from 50 to 250 ft. The portholes are controlled by gate valves whose handles extend to a grating about 15 ft below the floor on which the pump motors stand. By closing the appropriate valves, the temperature of the water entering the collector can be varied to some extent.

The floor of the pump house is at El. 507, several feet above the highest Wabash River stage on record at that point. Three 600-hp, 3-phase, 60-cycle electric motors take up most of the available room in the pump house. Each motor drives a deep-well turbine pump capable of lifting 5,000 gpm against 400 ft of head.

In addition to the electric motors, the controls for surge-relief valves, large oil-cooled transformers, or fice-motor appurtenances, and a Friez automatic water-stage recorder are also installed in the pump house.

SHELL FOR WELL CAISSON HAS PORTS FOR DRIVING LATERAL SLOTTED COLLECTOR PIPES

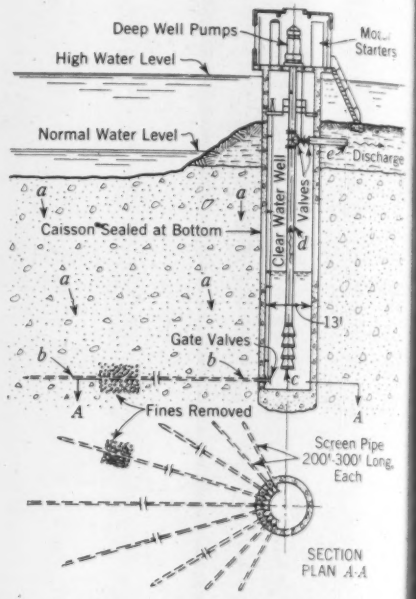


FIG. 1. SECTIONS THROUGH A COLLECTOR
Flow Is Indicated by Arrows

SOURCE OF THE WATER

The immediate source of the water supplying the collectors is the sand and gravel outwash of the collector-field area. However, in contrast to an ordinary well field, where seepage by rain water supplies most of the water, artificially induced infiltration from the nearby Wabash River is the principal source of water for the Ordnance Works. The variations in the temperature of the collector water bear out this conclusion. The average collector-water temperature follows the trend of river temperature with a lag of two to three months.

Experience with water-bearing formations that are not re-charged from a river or lake has demonstrated that the temperature of ground water remains constant and roughly equal to the average air temperature in the area. In the latitude of the Ordnance Works, a normal ground-water temperature of 54 F is to be expected. Therefore the observed variation of from 48 to 61 F is a positive indication that the stream is the source of the water pumped from the field.

Qualities such as the methyl orange (m.o.) alkalinity of the water, or the hardness (expressed in ppm of $CaCO_3$), did not remain constant during collector operation. During a 13-month period, January 1943 through January 1944, weekly water samples were taken from each of the collectors and analyzed for their chemical quality and bacterial content. After January 1944, owing to lack of manpower and because the characteristics were better known, a composite sample of all the collector water was analyzed instead. At collector No. 2, during the 13-month period, the m.o. alkalinity, expressed in ppm of $CaCO_3$, ranged from 211 to 270, and the hardness varied from 282 to 334. At the Terre Haute water works, daily figures on the m.o. alkalinity of the Wabash River are available. During the same period, floods excepted, the extremes recorded were 160 and 255. Apparently the alkalinity of the collector water and that of the river water fluctuated in approximately the same range.

As the quality of water obtained from wells tapping aquifers recharged by rain remains constant, the

recorded variations in the chemical composition of the collector water at the Ordnance Works are another indication that the Wabash River is supplying most of the water obtained from the field.

Thousands of bacteriological tests of the water produced by individual collectors have been made. The data fill several filing cabinets and may be summarized in a short statement: The only time that coliform organisms were ever found in water from the collectors was when the river rose above the surface of the terrace on which the collectors are located. And during several such periods, the sanitary quality of the water was not affected at all. The data from September 1943 to August 1945 were examined by the writer, and all the confirmatory tests with Brilliant Green bile were negative during that period. Apparently pathogenic bacteria die, or are destroyed, between the time that they leave the Wabash River and the time that the water which carried them arrives at the collectors. However, the exact mechanism is unknown either to the writer or to authorities of the U.S. Public Health Service, with whom a similar matter was discussed in connection with other Ranney-type installations. Needless to say, from a sanitary standpoint water from the Wabash River is not fit to drink without a considerable amount of treatment. The collector water, however, is bacteriologically safe without any sort of treatment.

CONCRETE CAISSONS WERE SUNK ALONG RIVER BANK

WATER LEVELS AND YIELDS

The fact that changes in river level were followed by immediate changes in water levels in the collector field, despite the nearly constant withdrawal of 72 mgd, is another positive indication that river water was infiltrating the collector field.

As the source of the collector water is the Wabash River, it is to be expected that the specific capacity of the collectors will change with the temperature (that is, the viscosity) of the water flowing to them from the river. This is explained by a study of Darcy's law, which can be written $Q/s = PA/\mu$. Here Q is the pumping rate; s, the drawdown; P, the permeability of the aquifer; A, the cross-sectional area of ground-water flow; μ, the coefficient of kinematic viscosity; and Q/s, the specific capacity of the well or collector.

Assuming that the permeability and cross-sectional area remain the same, the specific capacity will vary inversely as the viscosity. When the average of collector water and river temperature is low, the viscosity is high, and the specific capacity goes down. This occurs annually in the winter and spring. In the summer and fall, the average of collector water and river temperature is high, the viscosity is low, and the specific capacity is high. As the viscosity of water varies from about 0.98 centipoises at 70 F to 1.69 at 35 F, the expected range in the specific capacity of collectors yielding water most of which has been drawn from the Wabash, can be expected to vary considerably during the course of a year. This variation may be expected even though the well screens remain in perfect working condition.

This phenomenon is illustrated by water-level and pumpage data obtained from collector No. 2, which cover two complete yearly cycles (interference effects are neglected). These data appear in Table I.

The total available drawdown at collector No. 2 is 48 ft, assuming a Wabash River elevation of 462. This would indicate a potential yield of 16,000 gpm (23 mgd) under conditions as severe as those prevailing in December 1944, and a potential yield of about 31,000 gpm (45 mgd) under conditions similar to those existing in June 1945.

All the data relating to the Wabash River Ordnance Works, including water levels of the collectors and the Wabash River, collector-water temperatures, chemical and sanitary analyses of the collector water, and all data on pumping rates, were recorded by the DuPont Company, plant operators. These data were made available to the writer and have been released for publication by the Commanding Officer of the Ordnance Works, Maj. E. G. Miller, as were all illustrations accompanying this paper. Analyses of Wabash River water and records of river temperature at the Terre Haute water works are included through the courtesy of W. K. Durbin of the Terre Haute Water Company.

TABLE I. WATER-LEVEL AND PUMPAGE DATA FOR COLLECTOR NO. 2

DATE	WATER EL. IN COLLECTOR	WATER EL. IN WABASH RIVER	COLLECTOR DRAW-DOWN	COLLECTOR PUMPING RATE, Gpm	SPECIFIC CAP., Gpm per Ft	AV. TEMP. WABASH & COLLECTOR DURING MONTH	AV. PUMPING FROM COLLECTOR FIELD DURING MONTH, mgd
1/15/44	441.3	463.4	22.1	8,600	394	45.5 F	75
5/18/44	453.7	470.3	16.6	9,700	584	67.5	69.5
7/ 8/44	446.5	462.8	16.3	9,500	583	67	72.3
10/13/44	437.8	462.0	24.2	11,100	459	59.5	77.3
12/23/44	431.2	462.5	31.3	10,700	342	49	75.2
3/30/45	439.8	467.4	27.6	9,500	344	47	68.0
6/29/45	451.3	466.5	15.2	10,000	658	63	67.0

FOR DRIVING LATERAL SLOTTED COLLECTOR PIPES

Construction Costs Can Be Cut

By WILLIAM A. JOHNSON

PRESIDENT, AMERICAN PIPE AND CONSTRUCTION COMPANY, LOS ANGELES, CALIF.

CONSTRUCTION contracts lacking clarity, fairness, and consistency have delayed much needed work and have resulted in unnecessarily higher costs for owners. The contractor's viewpoint is presented by Mr. Johnson, whose suggestions come at a most appropriate time, when a special ASCE committee is in the process of preparing standard contract forms. (See CIVIL ENGINEERING *for August, page 365.) The threat of public-agency control of all construction is held by the author to be very real provided a streamlining of contracting procedure cannot be accomplished.*

ALL sections of the country have long-deferred construction projects begging to be done. How can this immense amount of potential construction be completed economically at a time when prices rise continuously? This question must be answered by engineers.

If the contract system stumbles over this obstacle of excessive costs, government bureaus will seize upon this as an excuse to take over and perform all their own engineering and construction work. Furthermore, if this cost problem is not solved satisfactorily, and the bureaus move in, it may affect the political life and freedom of the individual. We may be working for the state instead of the state for us. I mean by this last that there seems to be a well-defined philosophy lurking here and there in our government which leans toward the abolishment of private initiative and industry.

Contractors during the presence of the war years, and especially because of the cost-plus fixed-fee contact system, let costs get out of control. The Army and Navy proved to themselves that their cost-plus jobs in many cases—while cost-plus seemed necessary on account of the lack of time for preliminary plans—consumed endless time, caused untold confusion, and generally ran the cost up to astronomical figures. Most governmental bureaus and bodies know and recognize that the contract system produces work at less cost, generally better in quality and in much less elapsed time, than work done with their own forces.

Well, what are we going to do about these rising costs which may wipe out construction and engineering as an individualistic industry or profession? It would seem that some of the things that can be done are:

1. Recognize that high prices are with us. The tendency for the immediate years ahead will be steadily upward. Owners and public bodies and the public in general must recognize that such is the case and that postponement of an essential building or public improvement will mean a greater cost eventually.

2. Review all plans with a determination to cut out non-essentials and gingerbread.

3. Search out improvements that will result in structures having a longer life, structures more economical to operate, structures that give more for the money.

4. Improve construction inspection organizations. Instead of having contentious fly-specking, hair-splitting inspectors, it would be wise to secure men who could meet the public, learn to make decisions, keep costs and timing in mind, and perhaps frequently use their own good old common-sense judgment.

5. Examine specifications carefully. Are they filled full of unnecessary restrictive paragraphs? Cost-boosting restrictions always result in higher bids. I wish to quote from a letter frank-speaking Engineer Frank Crowe, Hon. M. ASCE, wrote a short time before his death:

> The specifications, as now set up, are as severe for a "lousie" little headgate on some isolated ditch bank as they should be for an approach structure to the White House. When those prices go up, the engineers will start to come to and write their own specifications instead of using the concrete technologist ghost writers, who really get down to the last half drop of water per yard of concrete. This knowledge, the result of extensive research, is of course interesting but it should not be written in specifications that have no need for such refinements. The question to ask is, "Will the structure know the difference as it goes on into eternity?" Usually the answer is "No," so why pay for it?
>
> A few of the hidden headaches are: curing concrete, sand-blasting, shining up reinforcement steel immediately before making a pour, filling minute cracks or holes in concrete forms which were good enough for any practical purpose.
>
> Water curing on small structures or power-house construction costs twice as much as mixing and placing the concrete and is of very little value to the structure. It just messes up the job continuously.

Add to these all the little petty whims of a temperamental inspector and you have a typical small-structure headache.

So, if we want relief we must go back to what is said in the specifications because these inspectors are given a set of specifications and "sicked" on the contractor. There is no comfort for the contractor in the specifications so the inspector reigns supreme.

6. Take uncertainties out of the contract. Do not force the contractor to take all the risks. He will only be forced to add a safe contingency to his bid. You will get better bids if you let the owner take at least part of the unknown risks.

7. Specifications should provide for prompt and reasonably generous payment. A $5,000,000 contract is about to be awarded on the West Coast. There is a $2,000 per day non-completion penalty, but in addition the specifications provide that no progress payments will be made if the contractor is behind in any month with the stiff eight-month completion schedule set up by the engineers. One or more contractors wish to use a different method from the conventional one. This would mean a larger original investment for plant, also a later start, although it would bring completion through on or before the allotted time. But according to the engineers' schedule, the contractor would be behind, so he could draw no payments until the final one. This would call for an expenditure of $4,000,000 of the contractor's money—when the municipality has the idle money in the bank. Therefore no bids will be received on this different method, although it should be much cheaper than the conventional one.

8. Owner's organizations and contracting bodies should look over their legal departments. The legal department may have grown so it actually encroaches upon and dominates the engineering. This, for effective and speedy engineering work, is getting the cart before the horse. The legal department may be staffed with super-technical people who delight in saying "no" instead of seeking a way to let the work proceed. Listening to this type of legal department is a very easy way to increase costs.

9. Last but not least, the engineer, owner, and contractor can in many instances work out difficult problems by getting together. Under present difficult conditions, fair-minded engineers and good contractors should and can work together. It is easy to remember what Benjamin Franklin said about not hanging together.

SOCIETY AFFAIRS

EDITORIAL:

It's Your Society

"TOO MANY LOCAL SECTIONS are purely social clubs;—possibly 50 percent are carrying on programs of value in terms of technical improvement of their members;—probably less than 200 members of the Society are actively engaged in the organized work of advancing and protecting the profession;—possibly another 500 are actively engaged through our Technical Divisions in the technical improvement of our members;—this is a rather poor showing for an organization with 22,000 members."

Excerpted from the address of ASCE President W. W. Horner (*Civil Engineering*, November 1946, page 481) before the Local Sections Conference held in conjunction with the Society's Fall Meeting in Kansas City in October, the foregoing remarks forcefully emphasize the need for the very thing he advocated: "drastic revision of the relationship between that part of our organization which is national in scope, that is the Board, the staff and the national committees on the one hand, and on the other, the members of the Society now organized into Local Sections."

Separately President Horner has stated that "Only a small minority of our Local Section members are aware of, or feel definite responsibility to attempt to participate in, the solution of professional problems of a national character. For this I *blame the Society as a whole*. Somehow we have heretofore failed to give to Local Section members the opportunity or the inspiration for participation of the kind the profession sorely needs." At the Kansas City meeting the Board reached conclusions intended to bring about a revision of the relationship above referred to. The Board approved the sending out to the Local Sections for consideration of some four different questions now before the Society, and by implication approved a policy to hereafter refer to the Local Sections as many matters as possible. This will provide Local Section members with the *opportunity* for participation.

It is hoped that the Local Section membership will take full advantage of these new opportunities, and will hereafter give to the Board, as far as possible, specific advice and assistance on all major Society problems. Local Section participation need not be confined to matters specifically referred to the Sections. It is to be expected that hereafter important proposals will be initiated by the Sections and brought to the Board's attention.

To stimulate more widespread discussion of affairs which are broader in character, the Board of Direction at its Kansas City meeting decided that any Local Section meeting, where the principal topic is Society affairs, shall constitute a "technical meeting" in connection with computing the Local Section allotment (*Civil Engineering*, November 1946, page 508).

The approach of the New Year, with its traditional resolution-making atmosphere, appears to be an ideal time for ASCE members to inquire of themselves:

"Have we in the past in our Local Sections been too 'local' in our thinking about Society affairs? Are we now ready to take full advantage of the opportunities newly afforded to us?"

Improvement in Technical Sessions Is Booklet's Aim

BETTER, MORE ENJOYABLE and more beneficial technical sessions is the objective of a booklet in process of preparation under direction of the Committee on Technical Procedure and the Committee on Division Activities. Satirical treatment of the much-discussed manner of presentation of technical papers has been adopted in the booklet, which will be distributed to prospective authors, Division chairmen and, on request, to Local Section officers, for distribution by them in turn to speakers at their own sessions.

On the following two pages this booklet is reproduced, so that all ASCE members may have opportunity to peruse this presentation of how, too often, "others see us."

Conference Is Held by Virginia Chapters

THE THREE BIG Virginia colleges—the University of Virginia, Virginia Military Institute, and Virginia Polytechnic Institute—sent delegates to an all-day Student Chapter Conference at Charlottesville, Va., on October 28. In spite of heavy rains, the attendance was close to 200.

E. L. Chandler, assistant to the Secretary and Washington representative of the Society, presided at several informal discussions in the morning, and in the afternoon accompanied the group on a field trip to the Moorman's River Dam. This project, which is under construction, will be a part of the Charlottesville water supply. Construction of the project was described in a talk by W. S. Grant, Jr., resident engineer on the project, and Mr. Chandler addressed the conference on "Engineer-Contractor Relations."

Dinner at the Monticello Hotel concluded the day. In addition to brief talks by students from the engineering schools, there was an address by Harry A. DeButts, operating vice-president of the Southern Railway.

You're Going to Present a Paper

Prepared by the
AMERICAN SOCIETY OF CIVIL ENGINEERS

AMERICAN SOCIETY OF CIVIL ENGINEERS FOUNDED 1852

...u're Going to Present a Pape

UNDOUBTEDLY a big moment in any man's life is the occasion when he presents a technical paper before fellow members of his Society. Still, despite the fact that all eyes are upon him and he is the center of attraction for the moment, he must be content with second place in the matter of importance. For the audience—the men who come to hear him and to learn what he has discovered in his work—must come first. They must be given every consideration and be assisted in accomplishing just those objectives—hearing the speaker and learning from him.

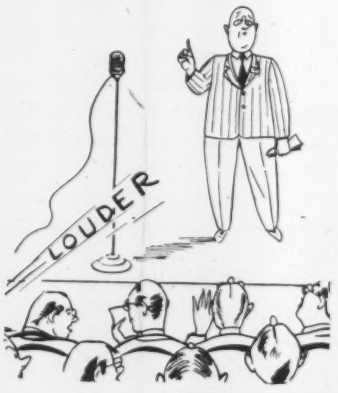
With these things in mind, the Committee on Technical Procedure and the Committee on Division Activities present this booklet to show how, too often, "others see us." It is hoped it will be accepted in the spirit in which it is offered and that it will result in better, more enjoyable and more beneficial technical sessions of ASCE.

• Not This ~

• But This ~

KEEP IT SHORT—A twenty-minute talk is better than one of half an hour's duration. The latter is about as long as you can expect to hold interest. No listener may be expected to absorb your analytical or mathematical data in one reading. Save such supporting matter for the published paper. Present orally only the significant parts, stressing what's NEW and INTERESTING in telling WHAT you did and WHY. Leave the "HOW" for the studious reader of the published paper.

• Not This ~



RELAX — Be friendly, both with your audience and the microphone, if one is provided. Statistics show not one single case of a man having been bitten by a "mike," so don't fight it. A touch of natural humor or human interest will add to your presentation. If there is no microphone, be sure to speak clearly enough so that those in the farthest seats will hear you, thus avoiding the ever-present risk of encountering one of those fellows who delight in shouting "louder," just as you think you're getting along so well.

• Not This ~

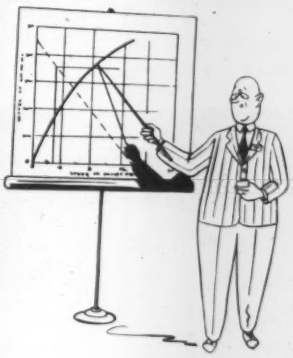
FACE YOUR AUDIENCE—Look at and speak to your audience. Preliminary preparation and familiarization with your paper will enable you to look up from time to time without losing your place, thus giving your audience the impression you are as interested in it as you'd like it to be in you. This will help put across your ideas more effectively. Better yet, have your subject mastered so a few cards containing an outline will be sufficient to guide you through your presentation.

of your talent, and the audience's time, to address your remarks confidentially to the lantern slides. So keep facing your audience every minute of the time you're talking. If it is absolutely necessary to turn toward the screen to point out some specific item, don't try to continue your talk while doing so. One thing at a time is the best way. The time lost is measurable in seconds. The words lost by the audience can never be recaptured.

t This ~

TEN THOUSAND WORDS — That's the reputed equivalent of one good picture. But it's not a good picture if it requires a lengthy word - explanation. So express only one idea on a slide, and make it simple and readily understood. Make it the kind of picture you need only name, thus avoiding repetition, in describing the slide, of what you have already presented before the slide came on.

• But This ~



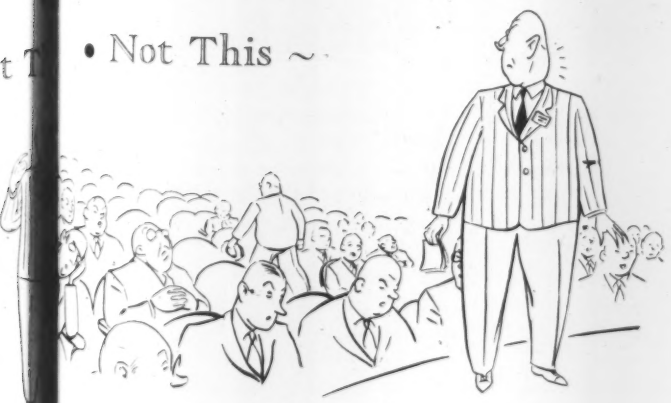
AND IN CONCLUSION—now we're getting somewhere. Have that conclusion ready at all times, so whether you're at a loss for words, or the chairman calls "time" on you (through no fault of yours, of course, but because other speakers have run over and thus prolonged the meeting), you can go right to your conclusion for an effective ending.

• But This ~

The Result ~

• This ~

• Not This ~



And Mr. Chairman ~ ~ ~

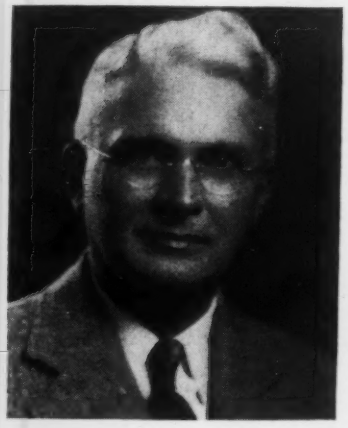
YOURS is an important role in the successful conduct of a technical session. For to you falls the responsibility of making the meeting as interesting and enjoyable and profitable as possible for those who attend. Talk things over with your speakers before the meeting. Emphasize the need for clear, distinctive speaking and the avoidance of monotone; discuss the time to be allotted to each speaker and arrange for unobtrusive signs by which you can keep them posted as to the time still remaining for each to speak.

FURTHER, arrange for someone to be posted in the rear of the meeting to signal you when it becomes difficult to hear the speaker back there, so you, in turn, can inform those on your program that their voices are not carrying their messages adequately. These things, as well as holding speakers to the time allotted, need not be matters of embarrassment if you talk them over in advance with the men on your program and everyone understands the necessity of a well-timed, well-run, smoothly operating meeting.

you through your presentation.

Professional Records of Nominees for ASCE Offices

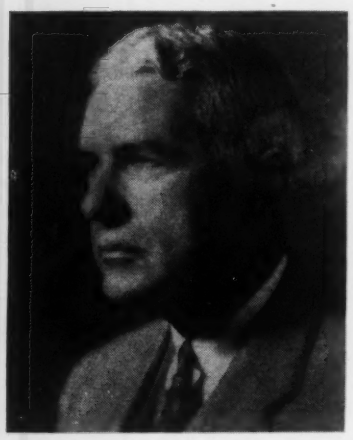
GAIL A. HATHAWAY
Nominee for Vice-President, Zone II



RALPH B. WILEY
Nominee for Vice-President, Zone III

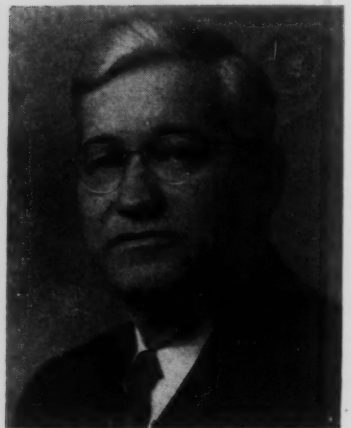
HARLAND C. WOODS
Nominee for Director, District 3

ROY W. CRUM
Nominee for Director, District 5

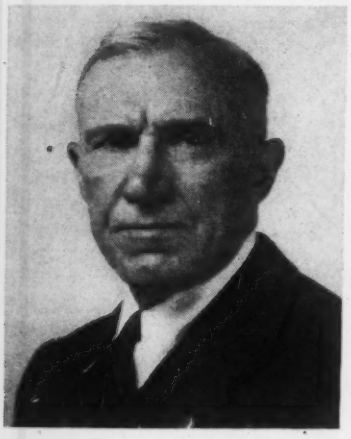


LEWIS M. GRAM
Nominee for Director, District 7

SAMUEL A. GREELEY
Nominee for Director, District 8



DANIEL V. TERRELL
Nominee for Director, District 9



WALDEN L. MALONY
Nominee for Director, District 12

DAVID L. ERICKSON
Nominee for Director, District 16

GAIL A. HATHAWAY

GAIL A. HATHAWAY, specialist in the fields of hydrology and hydraulics, is already on the Society's Board of Direction. He began a three-year term as Society Director from District 5 in January 1944, and in March 1946 was appointed Vice-President from Zone II to fill the unexpired term of A. C. Polk, who died on March 1. The appointment was in accordance with the Constitutional provision stipulating that a vacancy in the office of Vice-President shall be filled by the senior Director from the same Zone.

Elected a Member of the Society in 1934, Mr. Hathaway served on the Hydrology Committee of the Hydraulics Division from 1941 to 1943; on the Committee on Employment Conditions, as member in 1943, as contact member from

the Board of Direction in 1945, and as chairman in 1946; on the Committee on Membership Qualifications, 1944–1946; and on the Committee on Salaries as a contact member from the Board of Direction in 1946. For several years he has been active in the District of Columbia Section, of which he was president in 1942.

Mr. Hathaway entered Oregon State College in 1914. Upon declaration of war in 1917, he enlisted in the Army and was later commissioned as a 2nd lieutenant in the Artillery Corps. Upon his return from France, Mr. Hathaway reentered Oregon State College, and was graduated in 1922 with the degree of B.S. in C.E. In 1923, after early experience in connection with the construction of irrigation projects in central Oregon, he became assistant to the state engineer of Oregon on special river studies. He remained in that capacity until 1928, resigning to accept a position as hydraulic engineer with the Kansas City District Office of the U. S. Engineer Department. He remained in the Kansas City District Office from 1928 to 1933, and was in the Missouri River Division Office at Kansas City from 1934 to 1937. While Mr. Hathaway was with the Missouri River Division, he was engaged on the hydraulic design of Fort Peck Dam and served as consultant to the Engineer Department on hydrologic and meteorologic studies for other large dams in the Mississippi River Basin.

Since 1937 he has been in the Office of the Chief of Engineers, Washington, D.C., initially as chief of the Reservoir Regulation–Hydrology Branch, Engineering Division, and now as special assistant to the Chief of Engineers. In these positions he has received assignments of outstanding importance, including a special mission to the European Theater of Operations in November 1944 to organize and provide technical supervision over the Rhine River Flood Prediction Service. For this work he was awarded a Presidential Citation and the Bronze Star Medal. He also served as engineering consultant to President Truman's Special Cabinet Committee on Palestine, during recent meetings of the committee held in London. Mr. Hathaway has contributed several articles to technical publications in the fields of meteorology and hydrology.

His other professional affiliations include membership in the American Meteorological Society, the American Geophysical Union, the Washington Society of Engineers, the Society of American Military Engineers, Sigma Tau, and the Cosmos Club of Washington, D. C. He was president of the Washington branch of the American Meteorological Society in 1941 and is a registered professional engineer in the state of Oregon.

RALPH B. WILEY

A SPECIALIST IN engineering education, Ralph B. Wiley has taught at Purdue University without interruption for 38 years. He has served on many university committees and has been active in developing an extensive research program and graduate work in the civil engineering and engineering mechanics fields.

CIVIL ENGINEERING
Index in This Issue

ARTICLES and items which appeared in Volume 16 (1946) of CIVIL ENGINEERING are included in the index inserted within the back cover of this issue. The index is furnished as a separate unit so that it can be properly placed in bound volumes of the 1946 issues of CIVIL ENGINEERING.

Separate copies of the index are available on request to ASCE headquarters at 15 cents each.

Following his graduation from the University of Michigan in 1906, with the degree of bachelor of science in civil engineering, Mr. Wiley taught a summer session at his alma mater. Then, from September 1906 to September 1908, he was employed on the improved water and sewage works at Columbus, Ohio, under the late John H. Gregory, M. ASCE.

In September 1908, he was appointed instructor in hydraulics at Purdue University and has served there continuously. He was promoted through the various grades, becoming professor of sanitary engineering and acting head of the school of civil engineering in 1919. He was acting head of the engineering school from 1921 to 1922 and from 1929 to 1930. In 1937, he was appointed professor of civil engineering, head of the civil engineering school, and director of the Materials Testing Laboratory at the university. In 1938, Professor Wiley was given the additional position of director of the Indiana Joint Highway Research Project, and since 1944 he has also had supervision over engineering mechanics.

For many summers Professor Wiley was employed as sanitary engineer by the city of Detroit. In that capacity he designed the Connors Creek sewer and backwater gate and the Fox Creek backwater gate. He also was associated with the Indiana Flood Commission for one summer, and with Pearse, Greeley and Hansen, of Chicago, for three summers. In addition, he has made a number of reports on water supply and sewerage.

Long active in the service of the State of Indiana, Professor Wiley was state engineer for two years. At the present time, he is chairman of the Indiana Stream Pollution Control Board and a member of the executive committee of the Indiana Flood Control and Water Resources Commission.

Professor Wiley has long been interested in Society work. He joined as a Junior in 1908, became an Associate Member in 1916 and a Member in 1922. He has served on the Society's Committee on Student Chapters, having been chairman for 2 years. While a Director of the Society (1941 to 1943), he was chairman of the Committee on Publications for one year. At present, he is chairman of the Construction Division's Committee on Construction Contracts and Specifications, and is currently serving as president of the Indiana Section.

Professor Wiley has also been active in other organizations. From 1938 to 1941, he was a member of the council of the Society for the Promotion of Engineering Education (now the American Society for Engineering Education). This year he is vice-president of the Indiana Section of the American Water Works Association and of the Indiana Society of Professional Engineers. He is a member of Sigma Xi, Tau Beta Pi, Chi Epsilon, and Scabbard and Blade.

HARLAND C. WOODS

HARLAND C. WOODS attended the University of Nebraska, and was graduated in 1909 with the degree of bachelor of science in civil engineering. In 1911, he received the degree of C.E. from the University of Colorado for graduate work in civil engineering, economics, business organization, and corporation finance. Later he took graduate courses in civil and sanitary engineering at the University of Wisconsin and Michigan State College.

From 1909 to 1913 Mr. Woods was at the University of Colorado as an instructor in hydraulics, water supply, surveying, and other subjects. In the latter year he went to Constantinople, Turkey, as professor of civil engineering at Robert College, remaining there until 1917. From 1919 to 1923, Mr. Woods was again at Robert College, and from 1923 to 1929 he was associate professor of civil engineering at Michigan State College.

While teaching he also did consulting work in fields ranging from water supply and power to mapping and highway location and construction. His early practical experience included railway maintenance with the Chicago, Burlington & Quincy Railroad; valuation, water supply, and building construction work for the Union Pacific; and canal construction for Las Obraz Publicas de Canalization at Tampico, Mexico.

Since 1929 Mr. Woods has been with the Buffalo Office of the U.S. Engineer

Department on rivers and harbors, flood control, and beach erosion work, and is now the senior civilian engineer in the District. In this capacity, he is technical adviser and consultant to the District Engineer on the design and construction of breakwaters, piers, warehouses, retaining walls and marine structures of various types, on dredging work, and on flood-control projects. Mr. Woods is also in charge of the International Relations Section of the Buffalo Office, which cooperates with Canadian authorities in supervising the diversion of water for power and other purposes from the boundary waters of the Niagara and St. Lawrence rivers.

The end of World War I found Mr. Woods a captain in the Corps of Engineers, and between that time and World War II he took an active interest in the Engineer Reserves and their activities. In World War II he served as a lieutenant colonel, and for the greater part of the duration was detailed for special duties in the Engineer Office at Buffalo.

Elected a Junior in the Society in 1911, Mr. Woods became an Associate Member in 1913 and a full Member in 1921. He has been active in the Buffalo Section of the Society, which he has served as president. Mr. Woods is a member of the Society of American Military Engineers, and he is now vice-president of the Buffalo post.

ROY W. CRUM

ROY W. CRUM has been on the Society's Board of Direction since March 1946, when he was appointed Director from District 5 to fill the unexpired term of Gail A. Hathaway. Well known for his work in highway research, Mr. Crum is director of the Highway Research Board of the National Research Council, Washington, D.C.

He was graduated from Iowa State College in 1907 with a B.C.E. degree, and received the degree of C.E. in 1914. After serving parts of 1906 and 1907 as assistant on the engineer corps, Pennsylvania Lines, he joined the staff of his alma mater—first as an instructor and then as associate professor of civil engineering. During this period he was also connected with the Engineering Experiment Station at Iowa State College. From 1919 to 1928, Mr. Crum was engineer of materials and tests for the Iowa State Highway Commission. For the past 18 years he has occupied his present position.

His duties include the editorship of the Proceedings of the Highway Research Board and of Highway Research Abstracts. Mr. Crum is also the author of numerous articles on highway finance, economics, and engineering, which have appeared in Society and other technical publications.

Mr. Crum's affiliation with the Society dates back to 1913, when he became an Associate Member. He has been a Member since 1920. He has been active in the Iowa and District of Columbia Sections, serving as president of the Iowa Section in 1926 and of the District of Columbia Section in 1944. He was chairman of the Highway Division in 1932 and 1941.

His other affiliations include membership in the American Association for the Advancement of Science, the American Society for Testing Materials, the Association of Asphalt Paving Technologists, the Institute of Traffic Engineers, and the International Association of Road Congresses. He served as president of the Iowa Engineering Society in 1926 and of the American Concrete Institute in 1944. Mr. Crum is also a member of Sigma Xi, Tau Beta Pi, Phi Kappa Phi, and the Cosmos Club, of Washington.

LEWIS M. GRAM

WELL KNOWN in the field of engineering education is Lewis M. Gram, who has just retired as professor of civil engineering and chairman of the civil engineering department at the University of Michigan. A native of Michigan, Mr. Gram was educated at the University of Michigan, being graduated in 1901 with a B.S.C.E. degree.

From 1901 to 1904 he was employed, successively, in the Toledo offices of the American Bridge Company and the Massillon Bridge Company. He then entered the employ of A. Bentley & Sons Co., general contractors of Toledo, and for 4 years was in charge of engineering design, estimating, and field service on many sizable construction projects in Cincinnati and Toledo. Establishing a private practice in 1908, Mr. Gram was retained for a 4-year period by the Toledo Board of Education in charge of the structural design of all new school buildings. He also served as field engineer on other important projects.

In 1912 he was called to his alma mater by Henry E. Riggs, Past-President and Hon. M., ASCE, then chairman of the department of civil engineering, with an appointment as professor of structural engineering. In 1928 he succeeded Dr. Riggs as professor of civil engineering and chairman of the department, in which capacity he served until his retirement a few months ago. In addition to his teaching and administrative duties in the engineering college, Professor Gram was appointed in 1930 as director of plant extension, having general charge of the development of the physical plant of the university.

During his earlier years with the university, Professor Gram carried on a limited professional practice, the more important commissions including the preparation of preliminary plans for the Belle Isle Bridge, Detroit, and intermittent consulting service for the Board of Road Commissioners of Wayne County, Michigan. Actively interested in state and municipal affairs, he has served on many committees, including the Michigan State Planning Commission and the Ann Arbor City Council, where he promoted the enactment of a zoning ordinance and for nearly 10 years thereafter acted as chairman of a committee to administer it.

Professor Gram joined the Society in 1909 in the Associate Member grade, becoming a Member in 1916. He has been president of the Michigan Section of the Society and of the Toledo Society of Engineers. His other affiliations include the American Society for Engineering Education and the Michigan Engineering Society.

SAMUEL A. GREELEY

A SANITARY ENGINEER of many years' standing, Samuel A. Greeley—senior partner in the Chicago firm of Greeley and Hansen, hydraulic and sanitary engineers—has devoted much of his time to municipal engineering problems.

Mr. Greeley was graduated from Harvard College in 1903, with the A.B. degree, and from Massachusetts Institute of Technology in 1906, with the sanitary engineering degree. His first professional work was as assistant engineer for the New York firm of Hering and Fuller from 1904 to 1910. During this period, he was resident engineer in charge of the construction of a refuse disposal plant for Milwaukee. Later he was superintendent in charge of its operation. From 1912 to 1914 Mr. Greeley was an assistant engineer in the Sanitary Engineering Department of the Chicago Sanitary District.

In the latter year, he established his own private practice in Chicago. Since then he has been engaged on sanitary engineering projects by many municipalities, including New York, Chicago, Philadelphia, Los Angeles, Boston, Washington, Kansas City, Toronto, Buffalo, Miami, Worcester, Minneapolis, St. Paul, New Bedford, Grand Rapids, Peoria, and Rockford. His work has taken him to South America, England, and the Continent. During World War I, Mr. Greeley was sanitary engineer for the U.S. Shipping Board, and supervising engineer on the construction of Camp Custer, Michigan. During World War II, he served as special consultant to the Construction Division and the Corps of Engineers, and his firm had general charge of the layout and construction of Camp Forrest, Tennessee. Recently the firm was retained by the War Department to report on sewage disposal for the Canal Zone.

Since Mr. Greeley's election as a Junior in the Society in 1907 (he became Associate Member in 1913 and Member in 1918), he has been active in the technical affairs of the Society. He was chairman

of the Sanitary Engineering Division in 1927, and a member of its executive committee from 1929 to 1932. He has also served on the Committee on Sludge Digestion, the Joint Committee on Municipal Cleansing Practice, the Committee on Postwar Conditions, the Committee on Public Works of the Engineering Economics Division, and the Committee on the Organizing, Financing, and Administration of Sanitary Districts.

In addition to serving as president of the Illinois Section of the Society in 1934 and 1935, Mr. Greeley has been president of the Illinois Society of Engineers and of the American Society of Municipal Improvements (now the American Public Works Association).

Beginning with a paper on the "Operation of Reservoirs for Water Supply" in 1921 (TRANSACTIONS, Vol. 85, page 496), Mr. Greeley has submitted to the Society eleven papers on sanitary engineering subjects. Some of these papers have won for him the Thomas Fitch Rowland Prize, the Rudolph Hering Medal, and the James Laurie Prize. He was co-author, with Rudolph Hering, of a standard textbook entitled *Collection and Disposal of Municipal Refuse*, and, with William E. Stanley, he prepared two chapters in the *Handbook of Applied Hydraulics*. Mr. Greeley has also written many articles for technical journals.

DANIEL V. TERRELL

DANIEL V. TERRELL has spent his entire career in his native state, Kentucky. He was graduated from the University of Kentucky in 1910, with the degree of bachelor of civil engineering, and in 1914 received the degree of civil engineer.

Following his graduation, Mr. Terrell spent 2 years in railroad work. He then (in 1912) returned to the University of Kentucky as professor of highway engineering. In 1917, while serving as acting dean of the college of civil engineering, he was instrumental in the consolidation of three separate colleges into a college of engineering. From 1917 to 1942 he was professor of civil engineering and head of the department, and from 1942 to 1946, assistant dean. He was appointed dean of the college of engineering and director of the Engineering Experiment Station in September 1946.

As a special service to the university, he designed and constructed the university stadium in 1924 and 1925, and has since served as general consultant on campus planning and construction.

Dean Terrell has executed many special engagements for the state, such as summer employment with the Kentucky State Highway Department—from 1917 to 1928 as engineer of tests, and from 1928 to 1931 as research engineer. Since 1942 he has been director of the State Highway Research Laboratory. He was active in the early good-roads movement in Kentucky, and later supported the program for greater industrial development through research and more effective use of the state's natural resources. In 1944 and 1945 he was a member of the governor's Postwar Advisory Planning Commission.

In the field of federal service, Dean Terrell was state representative on local control surveys for the U.S. Coast and Geodetic Survey from 1933 to 1934; University of Kentucky representative on the Engineering, Science, Management, War Training Program from 1940 to 1945; administrator of the Engineers School, Enlisted Specialist Branch, from 1942 to 1943; and engineering administrator of the Army Specialized Training Program from 1943 to 1945.

Dean Terrell became an Associate Member of the Society in 1919, and a Member in 1926. He is a charter member and past-president of the Kentucky Section of the Society, and in 1921 he organized the University of Kentucky Student Chapter. He has served as president of the Kentucky Society for Professional Engineers, and also holds membership in the American Society for Engineering Education, the American Society for Testing Materials (on which he represents the University of Kentucky and the Kentucky State Highway Department), Tau Beta Pi, Sigma Xi, Triangle, and the University of Kentucky Research Club.

WALDEN L. MALONY

A CONSULTING ENGINEER, specializing in structural and sanitary engineering and water works, Walden L. Malony has maintained a consulting office in Spokane for the past 10 years. Although he was born in Michigan, his parents took him to Washington as a child, and he has spent much of his career in the Pacific Northwest.

Mr. Malony graduated from the State College of Washington in 1907, with a B.S. degree in civil engineering. From 1908 to 1912, he was in the bridge department of the Spokane City Engineer's office, employed on an extensive program of bridge construction, and for the next 3 years was with a railroad contractor on the construction of bridge foundations, tunnel lining, and concrete snowsheds.

During the first World War, Mr. Malony was, successively, supervising engineer on the initial construction of Camp Grant at Rockford, Ill., and supervising construction quartermaster, with the rank of major, in the Construction Division of the Army, handling the construction of warehouses and camp enlargements. After his discharge from the Army, he spent 8 years farming in eastern Washington, returning to engineering work in 1927. From the latter year to 1930, and during most of 1932, he was general superintendent on building construction for the Chicago architectural firm of Nimmons, Carr and Wright, and in 1931 and part of 1932 he was a structural engineer on subway design for the Chicago Bureau of Subways.

In 1933 Mr. Malony served as assistant engineer for the West Slope Construction Co. on the construction of San Gabriel Dam No. 1 in Los Angeles County, California, and then was construction engineer on a building program for the State College of Washington. Since 1936 Mr. Malony has maintained a consulting practice in Spokane, and for part of this period has also been connected with the architectural firm of Whitehouse and Price. For the latter firm he has been in charge of the design of the sewage and water systems and roads and drainage of the Naval Training Station at Farragut, Idaho; the Naval Supply Depot at Velox, Wash.; and the Marine Recuperation Barracks at Klamath Falls, Ore.

Mr. Malony became a Junior in the Society in 1909 and an Associate Member in 1915. Dropping out of the Society in 1919, when his interests turned to farming, he was reinstated as a Member in 1935. He has been active in the affairs of the Spokane Section for many years, and served it as president in 1938. At present, he is chairman of the Spokane Section Committee on Postwar Construction, and he was chairman of the program committee for the Annual Convention of the Society, which was held in Spokane last July.

Active in civic and community affairs, Mr. Malony is a member of the Pacific Northwest Sewage Works Association, the American Water Works Association, and the Northwest Scientific Association. He is also an honorary member of the State College of Washington chapter of Tau Beta Pi.

DAVID L. ERICKSON

DAVID L. ERICKSON has devoted his entire professional career to his native state, Nebraska. Graduating from the University of Nebraska in 1911, with the degree of B.S. in civil engineering, he was employed in the office of the City Engineer of Lincoln. He remained there until 1917, progressing to the position of office engineer. Mr. Erickson then accepted an appointment as deputy county engineer and deputy highway commissioner of Lancaster County. This was at a time when a new state law created the position of highway commissioner and delegated to that officer entire responsibility for county highway activities. Mr. Erickson assisted in the

organization of the new office and supervised a great deal of highway construction during his tenure of office.

In 1923 he was appointed City Engineer of Lincoln, and he has continued in that capacity until the present time. Since 1937 he has also held the position of director of parks, public property and improvements. In the latter capacity, he is directly responsible to the city council for the operation of the water and light, streets, sewers, paving, engineering, airport, building and plumbing inspection, and park and recreation departments as well as for the construction of all public improvements. Under his administration is included about 60 percent of the city personnel.

One of the larger projects planned and constructed by Mr. Erickson was the development of an additional source of water supply for the city of Lincoln, which involved exploration of all available sources and selection of a final site 25 miles distant.

Mr. Erickson became an Associate Member of the Society in 1919 and a Member in 1929. He served as president of the Nebraska Section in 1930 and has been chairman of the local Membership Qualifications Committee since 1937. At present, he is a member of the executive committee of the Engineering Economics Division of the Society.

A member of the American Water Works Association, Mr. Erickson was chairman of the Missouri Valley section in 1936 and is now serving a 3-year term as national director. In 1941 he was the recipient of the organization's George W. Fuller Award. He also belongs to the American Public Works Association (member of the Committee on Water Works); the Nebraska Engineering Society (president in 1934); and the Lincoln Engineers' Club. He is a member of the Nebraska State Board of Examiners for Professional Engineers and Architects, having served since 1937 when the Board was organized.

Fall Meeting of Tennessee Valley Section Features Society Affairs

NOT A SINGLE purely technical paper was presented in the course of the fall meeting of ASCE's Tennessee Valley Section. The "technical sessions" were devoted entirely to Society affairs and matters of general professional interest.

The meeting was held at the Hotel Patten in Chattanooga, November 8–9. Registration was on Friday morning, November 8, and papers and addresses filled Friday afternoon and Saturday morning. In the late afternoon of Friday the business meeting was held, followed by a social hour. The dinner and dance started at 7 o'clock. The men's luncheon on Saturday was followed by a trip through the Peerless Woolen Mills.

There was also a ladies' program, which on Friday consisted of visiting, sightseeing, shopping, and card games, and on Saturday of a trip through the orchid farm of Mr. Clint McDade preceding luncheon at the Fairyland Club.

At the opening session on Friday afternoon, an address of welcome was delivered for Mayor Bass of Chattanooga, and the response was by President W. F. Moehlman of the Tennessee Valley Section. Three speakers followed: Dean N. W. Dougherty, University of Tennessee, on "Professional Development and Professional Recognition;" W. H. Sears, on "Registration of Architects and Engineers;" and Dean F. E. Lewis, Vanderbilt University, on "The Attainment of Professional Objectives by Engineers."

New officers were installed, as follows: the new president, L. A. Schmidt, Jr., Chattanooga; and four vice-presidents, W. N. Calvert, Jr., Knoxville; C. M. DuBois, Chattanooga; Max Mitchell, Ashville; and Fred W. Thomas, Muscle Shoals.

The Saturday morning sesssion was presided over by Vice-President W. R. Eaton of the Ashville Subsection. The opening address was by the Section's retiring president, W. F. Moehlman, who reported on the Society's Fall Meeting in Kansas City.

James E. Jagger, New York, assistant Secretary of the Society, then spoke on "Society Operations and Their Expansion." He cited the expansion in Society activities that has taken place during the last quarter of a century, stressing the broadened character of its interests.

"Originally the Society was almost entirely technical in its interests," he stated. "Today the Society is vitally concerned with professional development, professional recognition, and professional objectives. The Society has not deviated from its aims toward technical improvement but it has broadened the scope of its aims beyond technology as the *sole* interest."

J. Elmer Housley, President of AIEE, discussed "The AIEE Program for Professional Development and Recognition for Engineers," presenting that society's plan for organization of the engineering profession.

The principal address, by ASCE President W. W. Horner, came last. Like Mr. Jagger, President Horner emphasized the fact that the Society "exists as much for the professional improvement of its membership as it does for the advancement of the science of engineering and architecture."

Providing each of his listeners with an analysis of the ASCE 1946–1947 budget as it was adopted by the Board of Direction at Kansas City, Mr. Horner pointed out that the budget involves anticipated expenditures of $692,000 against an estimated income of $636,000, or a budget deficit of about $56,000. He stated that the Society hopes to effect economies which will reduce that deficit figure, but that he saw "no possibility for the year ending in the black, and we will have to take a material sum out of our emergency

RETIRING PRESIDENT W. F. Moehlman (left) of the Tennessee Valley Section shakes hands with the incoming president, L. A. Schmidt, while two new vice presidents, W. N. Calvert, Jr. (next to Mr. Moehlman) and C. M. DuBois, look on.

operating reserve. This fund at the present time is only about $80,000, and we obviously could not live very long on that small amount of fat."

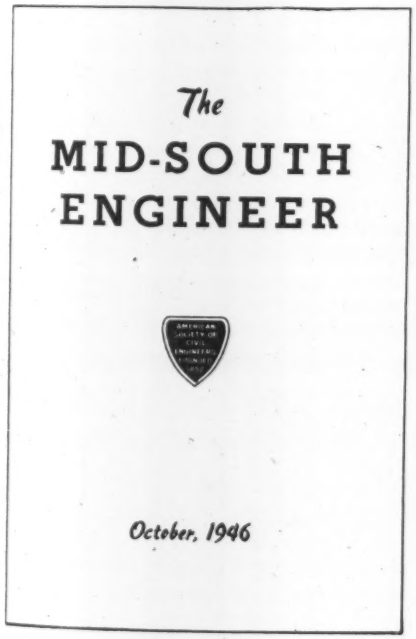
Discussing the Board's action at Kansas City, he stated:

"The Board adopted a resolution that steps be taken looking toward a ballot on a constitutional amendment to provide for an increase in payment by dues-paying members of $5.00 per year and by Juniors of $2.50. This is equivalent to about a 25% increase in dues income. Such an increase might permit continuing and expanding our activities somewhat for several years to come. A companion resolution of the Board provides that our financial operating situation be presented to the Local Sections, and, if possible, be discussed in detail by the Directors at meetings called for that purpose."

Throughout his address President Horner stressed the fact that any increase in dues would have to be authorized by the membership through a constitutional amendment and that this question should be discussed thoroughly at Local Section meetings. He stated further that if an increase in dues is not authorized by the membership, the Local Sections will then have to decide regarding the only possible alternative, "what activities are to be reduced."

Mid-South Section Has New Monthly Bulletin

WITH THE issuance of the October number of *The Mid-South Engineer*, the Mid-South Section adds to the list of noteworthy publications being put out by Local Sections. Besides routine announcements and reports of recent meetings, this new publication contains timely excerpts from papers presented at the summer meeting of the Section.



NEW LOCAL SECTION PUBLICATION LAUNCHED

The outstanding feature of the 39-page publication is a lengthy open letter to the membership from G. R. Schneider, president of the Section. Tackling the whole problem of the Local Section and its effective functioning within the framework of the Society and the profession, Mr. Schneider has analyzed every phase of the Section's activities and indicated its future objectives.

The present prospectus for the publication, as outlined by Mr. Schneider, calls for a quarterly issue, to be edited by a board appointed by the Section's board of directors. As now planned, the editorial board will include a representative from each Student Chapter as well as from each state within the Section boundaries.

Committee Comments on UN Site Report

THE UNITED NATIONS method for planning its ultimate permanent site—as to size and allowance for growth factor—has been endorsed by the Joint Advisory Committee on Planning and Development of the United Nations Headquarters, on which ASCE is represented. Also represented on this Joint Advisory Committee are the American Institute of Architects, the American Institute of Planners, and the American Society of Landscape Architects.

In a recent report, made in approval of the methods developed by the UN Headquarters Commission and Its Headquarters Planning Staff, the Joint Advisory Committee emphasized that it "has presented the case for each of the sites of different areas in a manner which will not impair the opportunity for whatever type of development those who will later be called upon to design and build the United Nations Headquarters and related community buildings may determine."

ASCE members on the Joint Advisory Committee are: Harold M. Lewis, consulting engineer, New York; Malcolm Pirnie, consulting engineer, New York; and Julius W. Pfau, chief engineer, New York Central Railroad, New York.

In concluding its report, the Joint Advisory Committee, whose duty it was to give assistance in the overall planning, but which was not involved in the selection of an actual site, stated:

"Should the Secretary General wish it to do so, this Committee, and the presidents of the four leading national technical societies, James R. Edmunds, Jr., American Institute of Architects, Earl Mills, American Institute of Planners, Markley Stevenson, American Society of Landscape Architects, and W. W. Horner, American Society of Civil Engineers, will be glad to be of service again in any way that may be helpful, and if desired would be glad to invite technical societies or groups from other nations to participate in subsequent activities of the Committee."

Dr. Vannevar Bush Wins Hoover Medal

THIS year's recipient of the Hoover Medal is Dr. Vannevar Bush, president of the Carnegie Institute of Washington and wartime head of the Office of Scientific Research and Development. Dr. Bush is a member of the American Institute of Electrical Engineers, and the award will be presented at the winter meeting of the A.I.E.E., to be held in New York in January.

Dr. Bush was born in Everett, Mass., in 1890, and educated at Tufts College, the Massachusetts Institute of Technology, and Harvard University. From 1919 to 1938 he was on the M.I.T. faculty—from 1932 on in the capacity of vice-president and dean of engineering. Since 1939 he has been president of the Carnegie Institute of Washington, and in 1940 President Roosevelt appointed him head of the Office of Scientific Research and Development. In the latter capacity he was prominent in the researches leading to the development of radar and the atomic bomb.

Established in 1930 in honor of Herbert Hoover, the medal is administered by the Hoover Medal Board of Award, consisting of representatives of the Four Founder Societies. Previous recipients include Herbert Hoover, Ambrose Swasey, and John F. Stevens, all Honorary Members ASCE, and Gano Dunn, M. ASCE.

Classification, Salary Reprints Are Available

REPRINTS of the Interim Classification and Compensation Plan for Professional Civil Engineering Positions, as published in the November issue of CIVIL ENGINEERING, pages 510–511, are available in limited numbers on request to Society headquarters. This reprint gives the interim recommendations for revisions of classifications and salaries for professional civil engineering positions as authorized by the Board of Direction of ASCE at its Fall Meeting in Kansas City.

Progress Recorded Following ASCE Salary Surveys

Study Published for Los Angeles County

A COMPREHENSIVE report on classifications and salaries for engineering positions in Los Angeles County service, based on a survey completed December 4, 1945, is now ready for limited distribution. This study, requested by Los Angeles County, was performed under Society auspices, requiring 31 weeks of Los Angeles residence by a staff member. It is a working document consisting of 16 pages of text, 16 appendices totaling 51 pages, 7 figures or charts, and 26 tables.

For the sake of economy, only 300 copies of the report have been printed, 100 copies of which have been purchased by Los Angeles County and 50 by the Engineers and Architects Association of Southern California. The remaining copies are for Society use and for sale at $2.00 each. Requests for copies are to be sent to the Executive Secretary, ASCE, at Society headquarters.

Highlights of the report are 13 tables of abstracts of job descriptions set up for ready comparison, a table of relative levels of 88 county engineering jobs (professional and subprofessional), tabular and graphical findings as to engineering salary rates being paid in the Los Angeles area as of April 1945, a discussion of factors to be considered in fixing salary rates, and an elementary discussion of point evaluation as a method for analyzing jobs and determining their relative level. The systematic salary schedule currently in use by Los Angeles County, familiarly known as the five-point plan, is reproduced for monthly as well as annual rates.

Texts and appendices are bound together, but the figures and tables may be removed for study in connection with the text.

Louisiana Gives Final Approval to Report

LATE IN OCTOBER, official word was received from the Louisiana state director of personnel, Dan S. Moore, that Governor Davis had changed the salaries of the state director of highways and the state director of public works from $7,500 to $9,000. This action with respect to two important appointive positions, although less than recommended in the Society-sponsored report last April, has raised sufficiently the previous salary ceilings for the classified services to enable needed classification corrections and salary adjustments to be made.

Following the governor's action, the heads of these two departments and of other state departments affected approved in its entirety the report and recommendations which resulted from a salary survey of all engineering positions in Louisiana state service, made last April under Society auspices at the request of the Louisiana State Civil Service. The Civil Service Commission at its meeting October 17, gave final approval to the Society report, and its provisions are to be made effective November 1, 1946.

Among the recommendations in that report are extension and adjustment of the classified series of professional classes to include a new Grade XIII; establishment of two new subprofessional classes, Engineering Aide IV and V, generally parallel to professional Grades I and II; establishment of separate classifications for certain specialized activities; improved salary ranges for positions at lower levels; and general adjustment of certain other salary ranges to yield an up-to-date, consistent salary schedule for all engineering positions in state service. Data collected on prevailing salaries in the state were analyzed and were effective in these adjustments.

A considerable number of specific problems of classification were also resolved in the light of the Society's experience in salary studies elsewhere.

It should be recorded publicly that whatever success has attended this effort on behalf of Louisiana engineers is due in large part to the understanding and thorough cooperation of many individuals, both in the state civil service staff and also in the several state departments which employ engineers. Also, a special committee of the Louisiana Local Section, ASCE, performed important functions in connection with the Society's standard procedure in such studies.

A limited number of copies of the Louisiana Salary Survey Report are available upon request to the Executive Secretary, ASCE, at Society headquarters.

Scholarship Established by Northwestern Section

INTEREST IN THE welfare of student groups and in strengthening the relation between the Society and Student Chapters has prompted the Northwestern Section to establish a scholarship at the University of Minnesota for the academic year, 1946–1947. The recipient of the award is to be selected by a scholarship committee, consisting of the president of the Section, the head of the civil engineering department at the university, the Faculty Adviser, and the Contact Member.

To be eligible, a student must have been in residence at the University of Minnesota for at least three quarters and a member of the Student Chapter for at least two quarters, as well as at the time of selection. He must also be enrolled in, or entering upon, his last year of undergraduate study in civil engineering. In selecting the recipient, the committee shall consider scholastic achievement, financial need, character, and evidence of potential success in the civil engineering field.

The scholarship will amount to $200, with one-third available to the recipient at the beginning of each quarter. Decision as to the award of the scholarship will be made annually by the Section.

J. P. H. Perry Again President of UET

AT A MEETING on October 24, in the Engineering Societies' Building, New York, J. P. H. Perry, M. ASCE, vice-president of the Turner Construction Company, was reelected president of United Engineering Trustees, Inc. A former ASCE Director, Mr. Perry has been closely affiliated with United Engineering Trustees for a number of years and has served it as director and vice-president.

United Engineering Trustees is a corporation set up jointly by the four Founder Societies. The corporation promotes the advancement of the engineering arts and sciences through two departments—the Engineering Foundation and the Engineering Societies Library. The corporation is the titular owner of the Engineering Societies Building and of the trust funds of the Library, the Foundation, the John Fritz Medal Board of Award, and the Daniel Guggenheim Medal Board of Award.

Request Is Made for Transactions Vol. 105

IT WILL BE appreciated if members having no further need for their copies of Vol. 105 of TRANSACTIONS will return them to Society headquarters, so that the Society may continue to fill occasional requests for back copies from colleges or libraries. Copies bound in leather, paper, or cloth will be acceptable.

Formation of Construction Research Board Recommended by Special Committee of CIAC

THE SPECIAL Research Committee of the Construction Industry Advisory Council—in a report prepared for the November 21–22 meeting of the Council—recommends that the National Academy of Sciences set up a centralized construction research agency, or Construction Research Board, to promote and encourage research in the construction industry and to coordinate investigations already under way.

The Construction Industry Advisory Council was set up in November 1945 by the Chamber of Commerce of the United States. (See item in CIVIL ENGINEERING for November 1945, page 523.) Its objectives are three: (1) to help develop construction industry opinion; (2) to make recommendations to the Construction and Civic Development Department Committee of the National Chamber of Commerce for carrying out policies and programs of common interest to the construction industry; and (3) to provide the Department Committee with better and more clearly defined contacts with trade and professional associations in the construction field.

In its recent report, the Council's Special Research Committee states that "the construction industry at the present time offers a fruitful field for both the extension and the greater utilization of its research activities . . . . Any savings which research can bring about through the development of better materials, more efficient methods, or in any other manner, will be multiplied many times and will greatly speed up the production of needed facilities."

Further excerpts from the report follow:

"There seems to be a widespread public opinion that construction, as compared with other industries, has been laggard in keeping up with the march of progress. Without attempting to pass upon the merits of this accusation, the committee suggests that active and aggressive efforts to stimulate and coordinate research in construction would offset this popular conception.

"There is a real need for an authoritative, disinterested body of unimpeachable standing which can bring together all available information relating to construction, evaluate it without bias, revealing both positive and negative implications, and circulate it on a large scale to the builders and contractors who must, in the last analysis, put it to use if we are to achieve improved efficiency at the level where the opportunity for improvement is most promising.

"But such an agency should do more than simply deal with research accomplishments of the past. It should also make preliminary explorations into promising research fields and stimulate interest in the intensive cultivation of such fields. By maintaining close contact with all construction research activities it could also warn against expensive and wasteful duplication of effort.

"The point should be emphasized that the function of this contemplated agency is not to take over and to centralize research in the construction industry. On the contrary, its purpose is to promote and to encourage research, not only by those groups already engaged in such activities, but also by others who may become interested.

"It is clear that unless there is some means of coordinating construction research by industry and governmental agencies, industry will pay double for its progress. It is also clear that unless industry takes the lead in supporting and guiding construction research, government agencies will step in without control or integration at exorbitantly high cost to all taxpayers.

"A pattern for guiding and stimulating research on an industry-wide basis has already been established and tested by the National Academy of Sciences, a scientific group of the highest standing which is carrying out many important projects. Operating through the National Research Council, the Academy has a Highway Research Board which has for many years coordinated and promoted research in the broad field of highway problems.

"Application of this same pattern to the general construction field is both logical and possible. Through informal conversations conducted without commitments on either side your committee has determined that, if the industry as a unit will express its desire and need for a Construction Industry Board modeled on this same pattern, the National Academy of Sciences will be disposed to give this request serious and favorable consideration.

"Such a Board would have two major divisions. At the top, with the general function of determining policies and exercising broad supervision, would be a committee of representatives from all elements of the construction industry, including but not necessarily limited to designers, contractors, suppliers, financial agencies, real estate interests and, in general, any group with a direct interest in the advancement of construction practices. Government construction and research agencies would also be represented.

"Subordinate to this group, and charged with responsibility for carrying out its directions, would be a permanent staff of highly qualified experts headed by a director. The size and composition of this staff would be determined by the extent of the program contemplated.

"Your committee estimates that this basic staff would require in the neighborhood of $100,000 annually for salaries and the necessary secretarial, office, and travel facilities.

"Your committee therefore makes the following recommendations:

"1. That the Construction Industry Advisory Council request the National Academy of Sciences, through the National Research Council, to establish a Construction Research Board, utilizing the general pattern already established by the existing Highway Research Board.

"2. That a committee be appointed to secure pledges from all elements of the construction industry of sufficient funds to underwrite the activities of the proposed Construction Research Board for a minimum period of five years.

"3. That a minimum annual budget to assure adequate functioning of the Construction Research Board should be agreed upon, with the clear understanding that additional funds will be sought as experience develops justification for an increased budget."

The committee responsible for this report is under the chairmanship of Eric A. Johnston. Its membership includes two ASCE members: R. G. Kimbell, Affiliate, Washington, D.C.; and John C. Stevens, Past-President, Portland, Ore.

ENR Editorializes on Dues Raise Proposal

IN CONNECTION with the discussions now being held by Local Sections regarding proposed increase of ASCE dues—$5 a year for Corporate Members and $2.50 a year for Juniors—(CIVIL ENGINEERING, November 1946, page 515), the following editorial from the October 31, 1946, issue of *Engineering News-Record* is of interest:

"At its recent meeting, the board of the American Society of Civil Engineers decided to ask the members to authorize an increase in dues, which have remained at the same level for 25 years. Increases in the cost of the Society's long-established services to its members and increasing demands for new services are the reason. Similar action was taken not long ago by the National Society of Professional Engineers and the constituent state societies. Such increases appear to be an inevitable result of the growing group consciousness of engineers and their desire to be heard on local, national, and international issues of engineering interest. Such organizations as the Inter-American Association of Sanitary Engineering, set up recently in Caracas, or the International Engineering Congress that was projected in Paris in September cannot carry on

without financial support, and it is obvious that the Engineers Joint Council will need more funds if it is to continue to function effectively. In agreeing to meet these higher necessary charges for society services, engineers will naturally expect that all duplications of services as between societies be carefully weeded out. To this end, as well as to effective use of increased revenues, society administrative bodies will need to bend their efforts."

St. Louis Section Has Atomic Power Meeting

THE MORE POSITIVE and useful aspects of atomic energy, as opposed to its destructive potentialities, were stressed by Dr. Charles Allen Thomas, vice-president and technical director of the Monsanto Chemical Co., in a talk before the St. Louis Section on November 4. Attendance of 125 set a record for the monthly luncheon meetings. Dr. Thomas—who as head of the Clinton Laboratories at Oak Ridge, Tenn., was a key figure in the development of atomic energy—compared the release of atomic energy to the ordinary fire. He pointed out, however, that nuclear fire does not deplete and exhaust a necessary environment, such as oxygen in the case of the ordinary, or electronic fire. Rather it is a progressive phenomenon, which emits neutrons (that fulfill the function of oxygen) and accelerates the processes.

One of the most valuable peacetime aspects of atomic fission involves the medical use of radioactive isotypes which are present in the ash or end product of nuclear combustion. These isotypes can be introduced into the body for the treatment of disease more successfully than radium, because the destructive effects of the latter are far more prolonged. Dr. Thomas stated that the demand for radioactive isotypes is so great that the National Academy of Science is screening requests for their use to allocate available isotypes to the best advantage.

Promising experimental work in the field of agriculture indicates the usefulness of the isotypes for the measurement of the assimilation of fertilizer by growing plants.

Dr. Thomas said that the use of atomic energy for the development of power offers one of its most dramatic possibilities. However, the size and weight of the shielding required to protect against the radioactivity limits the use of atomic energy plants to very large ships, such as the *Queen Mary*. In his opinion, atomic power plants will supplement, rather than supplant, existing hydroelectric and steam plants.

The peculiar advantages of the atomic plant are its suitability for inaccessible locations and undeveloped areas, and the fact that the fuel required involves very little bulk (a plane load of atomic fuel would be capable of running a plant for two or three years). Dr. Thomas concluded his discussion with the statement that to develop the wonders of the atomic age will obviously require control of the destructive aspects of atomic energy.

Dr. Thomas was one of a group of scientists to receive the Medal of Merit from Secretary of War Patterson in March 1946. He was also one of the five coauthors of "A Report on the International Control of Atomic Energy," which was prepared for the Secretary of State's Committee on Atomic Energy.

Technical Institutes Accredited by ECPD

FOR THE FIRST TIME engineering curricula of technical institutes have been accredited by the Engineers' Council for Professional Development. The committee charged with this work is headed by Dean H. P. Hammond, M. ASCE, of Pennsylvania State College. Curricula at three institutes have been approved: Wentworth Institute, Boston; Bliss Electrical School, Washington, D.C.; and Capitol Engineering Institute, Washington, D.C.

Members of Dean Hammond's committee for accrediting technical institutes are representatives of various types of institutions offering terminal technical programs, such as junior colleges, evening and extension divisions of colleges and universities, correspondence schools complying with certain regulations, and training programs of industry which fall within the technical institute field. Technical institutes are defined as being intermediate, that is, between high school or vocational school, and the engineering college.

The program of accrediting technical institutes had its origin in an investigation made by the Society for the Promotion of Engineering Education (now the American Society for Engineering Education), 1924 through 1929. This and subsequent studies have shown that while the number of persons holding engineering degrees from colleges and universities is from four to six times the number of graduates of technical institutes, the demand for technical institute graduates by industry is from four to six times the supply.

The program is carried out by a subcommittee of the Committee on Engineering Schools, which accredits undergraduate schools. Out of 167 degree-granting institutions in the United States, 133 now have one or more curricula accredited by ECPD, totaling 580 curricula in major and specialized fields.

ASCE Director Elected to State Legislature

ONE ASCE MEMBER who suited action to many words which have been spoken and written about the advisability of engineers' entering public life to a greater degree and participating more in civic affairs, is William D. Shannon, Seattle, Director of the Society. In the elections last month he was elected to the Washington State Legislature from the forty-third district, defeating his opponent by more than two to one—10,843 to 4,269.

W. D. SHANNON, ELECTED TO WASHINGTON LEGISLATURE

Long interested in good government, Mr. Shannon, a consulting engineer, has been active in Seattle and Washington politics for many years, but until now always only as a citizen interested in prevailing upon good candidates to run for office. Friends in Seattle are confident that excellent use will be made of his technical and business abilities during his tenure of office.

Plans for 94th Annual Meeting Near Completion

(*Continued from page 523*)

United Nations. Those taking this trip will have the opportunity of visiting the various council chambers of the United Nations. Admission tickets will be available at the registration desk to permit those who may wish to do so to sit in on other sessions of the United Nations.

ADVANCE REGISTRATION

Summary programs and advance registration cards will be mailed to members resident in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, and Virginia, and to all others who may request them.

REQUESTS FOR TICKETS

All requests for tickets should be accompanied by remittances. Remittances will be acknowledged but tickets will not be mailed. Instead, tickets ordered in advance will be held at the Society's Registration Desk at the Hotel Commodore, beginning Wednesday morning, January 15. Tickets to all functions will be on sale at the Registration Desk.

News of Local Sections

Coming Events

CENTRAL OHIO SECTION—Annual meeting at the Oxley Tea Room, Ohio State Univ. Campus, Columbus, December 12, at 6 p. m.

ILLINOIS SECTION—Meeting in the Western Society of Engineers Auditorium, Chicago, December 11, at 7 p.m.

METROPOLITAN SECTION—Meeting in the Engineering Societies Building, New York, December 18, at 8 p.m.

MID-SOUTH SECTION—Fall meeting at the Hotel Claridge, Memphis, Tenn., December 6 and 7. There will be an informal "Early Bird" meeting with refreshments Thursday night (December 5) for those who come early.

NORTHWESTERN SECTION—Annual dinner meeting at the Campus Club, University of Minnesota, December 9, at 6:30 p.m. Election of officers will be held.

PHILADELPHIA SECTION—Joint meeting with American Society of Mechanical Engineers in the Edison Building auditorium, Philadelphia, December 10, at 7:30 p.m.; dinner at the Engineers' Club, at 6 p.m.

SAN FRANCISCO SECTION—Dinner meeting at the San Francisco Engineers' Club, December 17, at 6 p.m.

TEXAS SECTION—Luncheon meeting of the Dallas Branch at the Adolphus Hotel, Dallas, January 6, at 12:15 p.m.; luncheon meeting of the Fort Worth Branch at the Blackstone Hotel, December 9, at 12:15 p.m.

WISCONSIN SECTION—Annual meeting in the Engineering Societies of Milwaukee Building, Milwaukee, December 19, at 7:30 p.m.

Recent Activities

CENTRAL OHIO

REPORTING ON recent Society activities before the October meeting of the Central Ohio Section, Society Director Frank C. Tolles emphasized the fact that, though the work of the Society is done largely through committees—by, say, 5 per cent of the membership—the other 95 per cent can and should function through the Local Sections. Mr. Tolles also covered the organization and activities of Engineers Joint Council, and discussed the subject of Society finances. A lively question-and-answer period concluded the program.

CLEVELAND

ABOUT 100 members and guests of the Cleveland Section, at a dinner meeting on October 30, heard Executive Secretary W. N. Carey speak on "The Society as a Business." An unusual feature of all regular meetings of the Cleveland Section is that wives of the members are invited, and from 20 to 40 usually attend each meeting. The ladies sit together in a group and use the dinner period for pleasant exchange of news and for discussion of the usual things of interest to groups of women. They have a permanent organization, with a chairman and secretary, and the "ASCE Wives Group" is an important factor in the success of all Cleveland Section activities.

In an informal after-dinner talk, Colonel Carey told the Section that the Society is a business corporation with a present annual budget of nearly $700,000. The purpose of the business, he said, is the advancement of civil engineering and civil engineers, the effort toward advancement being along three parallel routes of equal importance: professional, technical, and economic. Colonel Carey outlined the extraordinary expansion of Society activities in the past 25 years, and indicated that the Society must now secure additional income or face the alternative of radical curtailment of activities.

COLORADO

MEMBERS OF THE executive committee of the Society's Hydraulic Division—William A. Hoyt, Boris A. Bakhmeteff, Julian Hinds, and William H. Nalder—were dinner guests of the Colorado Section on October 14. The principal after-dinner talk was given by Dr. Bakhmeteff, who discussed the activities of the Highway Research Committee of EJC. Dr. Bakhmeteff stated that the present trend is toward objective research, as distinguished from fundamental research that is chiefly concerned with the discovery of fundamental laws governing physical phenomenon. Citing the role of the Society in research, Dr. Bakhmeteff stated that, at the present time, it has projects on columnar research and structural joints for bridges and buildings (particularly involving the use of bolts), and urged that these projects have the interest and support of all Society members.

DAYTON

A TOUR OF the Dayton Municipal Airport constituted the October meeting of the Section. The original airport, constructed in 1936, contained 4 runways on 360 acres. The Army expanded the field to take in about a thousand acres and added one runway and an apron. The City of Dayton recently acquired 300 additional acres, and is now remodeling a former Army building as a terminal. George McSherry, manager of the airport, conducted the group on a tour of the various facilities and installations.

DISTRICT OF COLUMBIA

JUNIORS HAD ARRANGED the program for the October meeting, which was held on the 22. Guest of honor and principal speaker was John V. Atanasoff, chief of the acoustic division of the Research Department at the Naval Ordnance Laboratory, Washington, who discussed technical aspects of the Bikini tests. He also showed slides of some of the meters and gages used to measure the pressures, and colored films of the two tests. John C. New, president of the Junior Forum, was master of ceremonies, and spoke briefly. Earlier in the month, 100 members of the Section and their friends were guests of the Naval Observatory, in Washington. The group inspected the instrument shop, the 26-in. and 40-in. telescopes, the clock house and 6-in. transit, and the library. The September meeting was held at the Dalecarlia (D.C.) water filtration plant. Personnel of the District of Columbia Water Department gave illustrated talks on the history and operation of the plant, and outlined plans for future expansion and improvement.

HAWAII

AT A RECENT dinner meeting Walter H. Samson, president of the Hawaii Section, reported on the Spokane Convention and asked that consideration of the collective-bargaining problem be reopened. Acting on his suggestion, the group decided to appoint a new committee to continue a study of the subject. The technical program consisted of a talk on "Expansion Plans of the Honolulu Gas Co.," given by John J. Winn, Jr., vice-president and general manager of the company.

INDIANA

SEEKING TO INCREASE the interest of Indiana engineers in government and community affairs in general, the Section is tentatively scheduling a series of programs on "The Engineering Profession and Government." The first of these meetings—a joint dinner with the Indiana Society of Professional Engineers, held on October 23—was addressed by A. A. Potter, dean of engineering at Purdue University. Dean Potter outlined the various attempts that have been made, in the past 30 years, to set up a functional organization that would unify engineers and

enable them to function most effectively in public welfare and government. Of equal importance is the task of making the public and the government conscious of the value and importance of the engineer's contribution. Of particular concern to all engineer citizens, the speaker pointed out, is the fact that "too few of our best people take sufficient interest in government and public affairs."

LOUISIANA

A stimulating feature of a recent meeting was a debate on the subject, "Civil Engineers Should Be Included in Any Over-all Engineers' Licensing Bill." The premise was upheld by James M. Todd, and the negative advanced by A. M. Fromherz. The subject aroused spirited discussion from the floor.

MARYLAND

GROUND WATER represents approximately one-fifth of the total water supply of the City of Baltimore, Dr. John C. Geyer told members of the Section attending the October dinner meeting. Total failure of this supply would represent a very great economic loss to industry as well as to the Baltimore taxpayer, he pointed out, and money spent to conserve this asset will be well spent. Dr. Geyer also discussed the drilling of wells, sealing against groundwater leakage, and the proper handling of abandoned wells. E. L. Chandler, Washington representative of the Society, addressed the November dinner meeting on "Engineers and Collective Bargaining." Mr. Chandler outlined the Society's accomplishments in the collective-bargaining field, and explained what the individual engineer must do to aline himself with the movement.

METROPOLITAN

PARTICIPATION OF Juniors in the speaking program of the Junior Branch was resumed at the November 13 session. Under the new arrangement, one member will speak briefly at each meeting on a topic of current interest. Lead-off man was Michael Yatsko, who discussed "Conference Leadership." The principal speaker of the evening was Nathan Kass, sanitary engineer for the New York Department of Public Works, whose subject was "Operation of a Sewage Treatment Plant." To follow up his talk, Mr. Kass arranged for the Branch to visit New York's Tallman's Island disposal plant.

MIAMI

THE MIAMI SECTION inaugurated its 1946–1947 season with a dinner meeting early in October. The whole session was devoted to ASCE business, both national and local. Following the reading of a letter from President Horner on EJC and a spirited discussion of the subject, a local committee was appointed to follow EJC activities in greater detail. More attention to public speaking was approved by the group and, in line with the Section's promotion of engineering education, a study of the engineering school situation at Miami University was reported and discussed. The presence of new members and applicants gave promise of a successful season ahead.

MICHIGAN

A SYMPOSIUM ON the plans and program of the Detroit Street Railways constituted the technical program at the November dinner meeting, which was held in Detroit. The principal speaker appearing on the program was Richard A. Sullivan, general manager of the Detroit Street Railways, and the discussers were E. H. Pate, A. L. Trout, L. G. Lenhardt, R. H. Corsen, and J. L. Wehmeyer. The list of guests included Prof. L. M. Gram, Society Director-elect from District 7; Frank L. Weaver, president of the District of Columbia Section; Elsie Hosten, president of the University of Detroit Student Chapter; and F. A. Mammel, president of the University of Michigan Chapter.

MID-SOUTH

SIXTY STUDENT CHAPTER members swelled the attendance at an all-day joint meeting of the Mid-South and Oklahoma Sections, held at Fort Smith, Ark., on October 26. The colleges represented were the University of Arkansas, the University of Oklahoma, and Oklahoma Agricultural and Mechanical College. With the exception of talks by Dr. Clark A. Dunn, vice-director of the Engineering Experiment Station at Oklahoma A. & M. College, and Society Director H. F. Thomson, the entire program was presented by Juniors and students. The list of speakers included David W. Bardwell, former captain with the 9th Army headquarters and at present connected with the Public Roads Administration at Oklahoma City; W. G. Chamberlain, member of the Oklahoma A. & M. Chapter; James Q. Neal and Homer F. Gilzow, members of the University of Arkansas Chapter; and Samuel C. Stephan, member of the University of Oklahoma Chapter. George R. Schneider, president of the Mid-South Section, called the morning session to order, and Leo D. Boswell, president of the Oklahoma Section, presided at the afternoon program. There was a joint luncheon at noon with the Fort Smith Engi-

DELEGATES AT KANSAS CITY LOCAL SECTION CONFERENCE, OCTOBER 14 AND 15

neers Club. It was the consensus of opinion that the occasion was unusually successful, and there was talk of making the joint meeting an annual event.

NORTHEASTERN

THE SECTION'S annual "Student Night" was celebrated on October 28 at a joint dinner meeting with the Boston Society of Civil Engineers. An illustrated lecture by Col. Carroll T. Newton, of the Army Corps of Engineers, comprised the technical program. Colonel Newton spoke on the engineering services of the U.S. Waterways Experiment Station, with special reference to the Mississippi Basin Model.

NORTHWESTERN

PART OF THE November dinner meeting was devoted to business discussion. The meeting was then turned over to George M. Shepard, city engineer of St. Paul, who discussed the location of trunk highways in St. Paul in relation to the Capitol approach. Mr. Shepard illustrated his talk with lay-outs, plans, and other studies.

PHILADELPHIA

A NEW TECHNIQUE in pre-casting concrete, developed during the war by the Bureau of Yards and Docks, was explained by Arsham A. Amirikian, principal engineer for the Bureau, at the Section's first meeting of the 1946–1947 season. Mr. Amirikian stated that the problem presented to the Bureau—design and construction of a concrete landing craft, 32 ft wide by 110 ft long, maximum pay load 150 tons, to simulate a similar steel plate structure—was "impossible" of solution if viewed in the light of conventional American design of reinforced concrete structures. Mr. Amirikian demonstrated by lantern slides salient points in the design and construction of the craft, pointing out that when the pre-casting technique was fully developed the cost of construction became a tonnage factor because of the lightness of the concrete. Following his discussion of the use of pre-casting for floating structures, the speaker then showed how the technique was adopted by the Navy for shore buildings. A sound film, describing in detail the erection of a Navy warehouse designed completely on the basis of the new pre-casting criteria, concluded the program.

PROVIDENCE

ALTHOUGH EXPRESSWAYS are essential in dealing with the traffic problem in metropolitan communities, these highways alone will not solve urban America's problem of moving people into and out of its large cities, Charles E. DeLeuw, Chicago consultant, told members of the Providence Section at their October meeting. "Along with new design principles," he said, "has come something even more important—recognition of the need for coordinated planning. So that while we propose freeways or expressways as an engineer's answer to mounting traffic problems," Mr. DeLeuw concluded, "we recognize the need of and advocate the coordination of these plans with mass transportation, existing street patterns, new off-street parking facilities, truck and bus or railroad terminals, improved traffic control, and perhaps new building and zoning regulations." Mr. DeLeuw's firm is, at present, associated with several other firms in carrying out a federal-state contract to plan the Pawtucket-Providence section of the proposed inter-state highway.

ROCHESTER

Speaking before the October dinner meeting, Carey Brown reported the meeting of representatives of New York State Local Sections, at which the state committee was formed. He stated that, since the meeting in June, the organization has been ratified by four of the six Sections in the state. The feature of the evening was a talk by George W. Moore, of the New York State Department of Public Health, who explained the organization and functioning of his department and the administration of the State Sanitary Code by the Public Health Council. Mr. Moore described ways in which engineers may be aided in the construction of private projects, and discussed the obligation of the individual engineer to comply with Health Department regulations in such matters as industrial waste, sewage, smoke and water gases, water supplies, and swimming pools.

SACRAMENTO

ONE OF THE outstanding events in October was the annual "Ladies' Day," at which Dr. Baldwin M. Woods, of the University of California, spoke to the members and their guests on "Technological Tomorrow." Dr. Woods, who is director of the University Extension Service, explained his interest in the Service. He said he had found that college graduates spend their first year out of college discovering what they should have learned and the next 20 years trying to learn it. In other words, adults are the group that need education. Another event of special interest was the 66th meeting of the Speakers Club, at which the members discussed the benefits they have obtained from participation in the programs of the Club. With Mel Davison acting as toastmaster, the group presented a varied program of talks. The list of speakers included Bill Popper, Stewart Mitchell, Irvin Ingerson, and Leonard Hollister. At the conclusion of the talks, the guest critic rounded out the program with an analysis of the scheduled speeches.

SAN DIEGO

THE PERSONNEL structure of the Society was described by Walter E. Jessup, Western representative of the ASCE, at the October meeting. Mr. Jessup also gave detailed information on the collective-bargaining situation, and outlined current Society activities. Other fall meetings have been devoted to business discussion.

SAN FRANCISCO

THERE WAS A large turnout for the October dinner meeting, for which a symposium on the aviation industry had been scheduled. The speakers appearing on this program were James M. Kite, plant engineer for the Consolidated Vultee Aircraft Corp., who spoke on developments in the field of airplane construction; Philip A. Hahn, chief of the Airport Engineering Division for Region 6 of the Civil Aeronautics Administration, who discussed airport requirements; and J. G. Bastow, assistant manager and assistant chief engineer of the Port of Oakland, who described the administrative problems of airports and the effect of recent developments on this phase of the subject.

SEATTLE

EJC ACTIVITIES were outlined by Society Director W. D. Shannon at a recent meeting. The technical program consisted of talks by Horace T. Pentecost, designer and manufacturer of the "Hoppi-Copter"; Leonard L. Eastly, of United Airlines; and Cornelius Lancsos, of the Boeing Aircraft Co. At another recent meeting, Richard G. Tyler, professor of civil engineering at the University of California, discussed the results of two years of research work at the university on the treatment of waste sulfite liquor by the trickling filter process. The second scheduled speaker was Emil C. Jensen, chief of the division of public health engineering in the Washington State Department of Health.

SPOKANE

GUEST OF HONOR and principal speaker at the October dinner meeting was Raymond P. Kelley, executive secretary of the Downtown Parking Association. Discussing the present parking problem in downtown Spokane, Mr. Kelley emphasized the com-

plexities of the situation and urged the membership to aid the association in finding a solution to the problem. During the business session, it was voted to resume the annual prize competition for the best technical papers submitted by Student Chapter members within the boundaries of the Section.

TACOMA

AT A RECENT dinner meeting Charles E. Andrew, chief consulting engineer for the Washington Toll Bridge Authority, spoke on the design of the new Tacoma Narrows Bridge, and described some of the outstanding features that have been incorporated in the proposed new bridge. Mr. Andrew also discussed the wind tunnel tests, which have been carried out by the Toll Bridge Authority at the University of Washington. During the business session, Walter Jantz announced his resignation as secretary-treasurer, because he is moving out of the Tacoma area.

TEXAS

THE ROLE OF the individual in good government was emphasized by J. Frank Wilson, nominee for Congress, in a pre-election luncheon meeting, held by the Dallas Branch of the Texas Section. Despite the complexities of our government, Mr. Wilson pointed out, the effort of the individual congressman and of the well-informed citizen can play an important part in obtaining beneficial legislation. The speaker also discussed the lifting of government controls.

TRI-CITY

"PUBLIC EDUCATION is necessary for the successful undertaking of any needed municipal improvement," Allen R. Boudinot, civil engineer of Moline, Ill., told members of the Section, meeting in Davenport, Iowa, on October 31. Stating that the essential projects necessary for the health of the community have been voted down primarily because the community has not been properly informed in advance of the need for the improvements, the speaker urged the advisability of preparing the public for engineering improvements before the engineer is hired. Mr. Boudinot also discussed the engineering problems he has encountered in his 40 years of civil engineering practice in the tri-cities area.

VIRGINIA

STUDENT PAPERS comprised part of the technical program at the fall meeting, which took place in Roanoke on November 2. They were given by R. E. Gleason, of Virginia Military Institute, and F. R. Katz, of Virginia Polytechnic Institute. The principal after-dinner speaker was Norman Jones, director of training for the Blue Ridge Division of the Lees Cochrane Company. Mr. Jones' subject was "Training for Leadership."

WISCONSIN

CHARLES W. YODER, secretary of the Section, reported on the Local Sections Conference, held in Kansas City, at the October 31 meeting. The speaker of the evening—Harry C. Boardman, research engineer for the Chicago Bridge and Iron Company, Chicago—was then introduced. Mr. Boardman gave an illustrated talk on the construction of welded tank construction for the storage of gases and liquids. Interest in his subject was attested by an enthusiastic general discussion that concluded the program.

Student Chapter Notes

MANHATTAN COLLEGE

The Manhattan Engineer, organ of the Manhattan College Student Chapter, has resumed publication after a lapse of three years. Founded in 1940 to give the undergraduates in the engineering school a medium in which to express themselves, it is the first departmental, and only technical, periodical published at Manhattan College. *The Manhattan Engineer* grew out of the *Transit News*, an engineering alumni publication designed to keep the engineering alumni in close contact with each other. *The Transit News* is still continued as a department in *The Manhattan Engineer*. From the first issue, student interest in the newer publication continued to grow, and by January 1943 it was being published quarterly. However, since the war had reduced the enrolment in the engineering school to less than 100, publication was suspended with that number.

UNIVERSITY OF DETROIT

THE OCTOBER MEETING of the University of Detroit Student Chapter was addressed by Lewis Kirshner, of the U.S. Lake Survey Program. Mr. Kirshner described the work of the Survey, whose main office is located in Detroit. There were approximately 60 present. Reporting an active year, the Chapter states that a special trip to Chicago will be made in the near future to study the construction of the subway system there. As president of the Chapter, Elsie Hosten represented the organization at the Kansas City Meeting.

LOUISIANA STATE UNIVERSITY

WITH THE RETURN of many former students and the addition of new ones, the Student Chapter at Louisiana State University reports that it is looking forward to a year of intense activity. The civil engineering enrollment rose from 13 in February of last year to 135 in September, an increase of over 1,000 per cent. During the fall, there have been several well-attended meetings, devoted chiefly to problems of organization. Officers for the present year, elected at a recent session, are shown in the accompanying photograph.

CHAPTER AT LOUISIANA STATE U. ELECTS NEW OFFICERS

Front Row (Left to Right): Loyd J. Rockhold, President; G. W. Tillery, Vice-President. Second Row, C. W. Hill, Assistant Secretary; J. T. Kramer, Secretary; and P. A. Winchester, Treasurer.

About Engineers and Engineering

Professional Bargaining Discussed by ASME Head

YOUNGER ENGINEERS, who are the potential from which the next generation of managers and executives will come, should weigh carefully all values "when they are confronted with decisions concerning collective action," and "beware of the limitations of a system which is designed for the average engineer."

These statements were contained in an address delivered recently by D. Robert Yarnall, Philadelphia, president of the American Society of Mechanical Engineers, before the Metropolitan Section of ASCE in New York. In the address Mr. Yarnall raised the question:

"If a young man joins a white-collar union representing engineers and draftsmen, how will the transition period from his classification as a union member to his classification as an executive or manager be made?"

Placing better industrial relations high on the list of responsibilities that must be shouldered by the engineering societies, Mr. Yarnall said younger engineers "want some organization to turn to now, and if I understand them correctly, they do not want the union kind.

"It is true that 'the best men have high scarcity value' hence they can best bargain individually. Men of average or less than average ability certainly have less power in individual bargaining, but does it necessarily follow that their best course for advancement would come through unionism and collective bargaining? This is where good management should provide an adequate personnel policy which will not lose touch with either the best man, the average man, or the sub-average man in their needs and right for advancement. How can we better develop a professional spirit in engineering than by driving home over and over again our conviction that management must assume more responsibility for encouragement, recognition, and advancement (when earned) of all technical men?"

Pointing out that the ASME is, "on legal advice, inhibited from taking formal action," Mr. Yarnall stressed the fact that Engineers Joint Council, representing five of the leading engineering societies, has established a committee on the economic status of the engineer and is conducting surveys among their memberships, among industrial concerns, and in the field of collective bargaining.

He stated that another course of action is suggested by the recent formation of the National Professional Association of Engineers, Architects, and Scientists (CIVIL ENGINEERING, November 1946, page 480), which plans "to assist groups to set up independent bargaining units, independent of the national unions."

Cities Conduct Experiments in Fringe Parking Measures

SHUTTLE BUS SERVICE from parking lots in fringe areas seems to be gaining in popularity as a means of relieving the downtown parking problems of cities. This view is expressed in a recent news report of the Automotive Safety Foundation. Denver, Atlanta, Baltimore, and Cincinnati are among the cities that have tried or are tryng experiments of this sort.

In Denver, two G.I.'s have started a shoppers' parking service consisting of shuttle station-wagon service from an outlying parking lot to seven downtown department stores, which are helping to finance the service. When a parker wishes to depart, she notifies the store attendant at the station-wagon stop. By direct line the attendant calls the parking lot and the shopper's car is waiting when she arrives. The present parking fee is 15 cents an hour. Department-store contributions are limited to a six-month trial period.

In Atlanta the parking area is $1\frac{1}{2}$ miles from the central business district. A flat rate of 35 cents includes parking and round-trip transportation over various bus and trolley routes. The service, operated by a motion picture theater, is available from 8 to 6 daily. Other times and Sundays the lots are reserved for theater patrons.

In the case of Baltimore, the privately owned transit company is trying out a shuttle system on a strictly profit-making basis. The company believes that a reduction in the number of passenger cars in the downtown district will result in better, faster, and more profitable transit service. At present the idea is being tried out from one outlying parking lot.

As for Cincinnati, it has recently concluded a 90-day experiment in shuttle bus and fringe parking—discontinued because the lots were being used to a small percentage of their capacity and the bus operation suffered a loss. To forestall complaints expected to arise from the banning of curb parking in "super-congested" downtown streets, two parking lots had been established at opposite corners of the congested area. The transit company provided bus service every five minutes at five cents a fare, but the buses had to be used on regular lines at rush hours so that the shuttle service was limited to between 9 a.m. and 4 p.m.

A city official commented that "we do not consider this experiment to have been a failure as it did bring out the fact that fringe parking does not seem to be the answer to the parking problem in so far as shoppers are concerned. If the bus service could have been supplied for a longer period, it is probable that the parking lots would have received much better patronage as they could have been used by all-day parkers."

Large Housing Project Planned for Chicago

BUILT ACCORDING to the most advanced concepts of city planning, a $70,000,000 city will be constructed on 2,300 acres of land, 30 miles south of the Chicago Loop, American Community Builders, Inc., of Chicago has announced. The initial construction has been planned to meet the need of veterans under the Veterans Emergency Housing Program.

Field work is under way, and the actual construction of homes will begin in the spring. Preliminary arrangements have been made with Edward J. Kelly, M. ASCE, mayor of Chicago and district director of the Federal Housing Administration, and his technical staff. Financing will be under the Federal Housing Authority.

Present plans call for houses selling from $7,000 to $10,000, with provision for 600 rental units. The initial program will accommodate 5,500 families, and a later expansion is planned for approximately 3,000 more.

Philip M. Klutznick, former commissioner of the FHA, is president of American Community Builders, Inc. Elbert Peets, of Washington, D.C., who collaborated in the planning of the towns of Kohler and Greendale near Milwaukee, designed the basic plan for the community, in conjunction with Loebl and Schlossman. The construction division is headed by Allan S. Harrison, of New York, who was in charge of the Navy construction program in Ireland.

Suspension Dam?

SUBMITTED by Lewis M. Hammond, M. ASCE, Milwaukee, Wis., as an interesting

Lots of Power There—When It Goes Through the Powerhouse

stress analysis job to help our members while away their time during the long winter nights ahead, the reverse-arch dam reproduced here should open the way to many new concepts in concrete design. Despite the unusual design features, the point of the cartoon—which appeared in the *Milwaukee Journal* prior to the November elections—was undoubtedly well received.

AGC Recommends Lifting of Government Controls on the Construction Industry

THESE EXCERPTS are from an address delivered by H. E. Foreman, managing director of AGC, before the National Housing Conference of the American Legion prior to changes which have been made in government controls since the November elections.

IN A TALK before the National Housing Conference of the American Legion, H. E. Foreman, managing director of the Associated General Contractors of America, expressed the association's conviction that housing and all other types of construction necessary to development of the nation can be carried out more quickly, more efficiently, and more economically when governmental restrictions, regulations, and controls over the construction industry are abolished.

The following quotations from Mr. Foreman's talk further express the opinion of the AGC on this vital issue:

"There is scarcely an activity of any kind in this country which does not require some form of construction. It can be said truthfully that America progresses through construction.

"The period of its greatest activity in history lies ahead of the construction industry. At no single time has there been the tremendous demand for all types of construction which now faces the industry.

"It has been more than 15 years since the nation has constructed its physical facilities at the rate needed for its development to the fullest extent of its potentials.

"People of the nation need new homes for better living. They need more factories for the increased production of goods. They need additional facilities for generating power for this production. They need new and improved highways, streets, airports, railroad lines, ship channels, docks and other facilities for better transportation.

"They need new and improved commercial structures where increased business activity can take place. They need new and better projects for control of floods, for development of water resources, for irrigation. They need new and improved hospitals, water and sewer systems. They need more schools and recreational facilities.

"People need these facilities and others for better living, and for growth and progress of the nation which will mean a sustained high level of business opportunities and employment.

"For example, on the average, in the production industries an investment of $6,000 is necessary to provide permanent employment for one worker. Of this, approximately one-third, or $2,000, is in construction. If the investment in construction is not made, however, the other parts of the investment are not made either. The importance of this fact is that as the investment per worker increases, so does his productivity, an so does his real income. This indicates how higher standards of living come about through products of the construction industry. These facts are of importance to veterans.

"The construction industry exists, basically, to serve one function in American life. That is to construct as efficiently, as economically, and as promptly as possible the physical improvements needed by the nation.

"Produets of the construction industry serve every form of American life. Operations of the construction industry account for 10 to 15 percent of the total national output.

"A construction volume of $20,000,000,000 a year—which should be attained soon—would provide direct employment for 4,000,000 people, and employment indirectly for an additional 8,000,000 in providing materials and services.

"These factors require consideration along with housing needs. Shutting off other types of construction delays the progress which depends on those types of construction. Too drastic curtailment of the types which expand our economy can lead to the start of a depression.

"The construction industry now is able to serve the public, not to the extent of its abilities, but to the extent permitted by governmental regulation.

"The attempt has been made by the federal government to regulate the operations of the construction industry, which is one of the most vast and complex of all industries.

"The industry conducts its operations at sites throughout the country. It includes thousands of individual establishments, which, incidentally, offer new employment and business opportunities for veterans. At the site it normally employs more workers than any other activity except agriculture. It is composed of workers of many different kinds of skills. A tremendous variety of products from other industries are necessary for completion of its projects and its efficiency requires a skillful coordination and scheduling of operations and flow of materials.

"The controls discourage the taking of risks, and in that respect have had a retarding influence on the construction of new living accommodations.

"The regulations control the types of construction which the industry can undertake. This provides an opportunity for manipulation and the granting of permission to who may or may not undertake new construction.

"The greatest danger in the controls, regulations and restrictions is that they provide a means not only of regulating the construction industry, but also of regulating the entire national economy by the federal government.

"Because the growth, expansion, and improvements of practically all types of activity in the country require some form of construction before they can proceed, the power to direct and regulate operations of the construction industry also is the power to direct and regulate all other forms of the nation's activity to a large extent.

"The recommendation of the association comes from the conviction, which has been expressed repeatedly by leading general contractors throughout the country, that the construction industry can carry out the housing and other construction vitally needed for development of the nation more quickly, more efficiently, and more economically when governmental regulations of the construction industry and the other industries supplying it are abolished.

"The removal of regulations does not constitute a magic plan, complete with a set of statistics, which will show that within a year or two everyone will be well housed and the demand of all other forms of the national economy will be fulfilled. The demands for new housing and all other forms of construction are so great that they cannot be fulfilled immediately even with production far above any previous peaks.

"Lifting of restrictions means only that the natural forces of the industry can attack the deficiencies of all types of construction which face the nation. The fact that there is a tremendous demand for housing, which cannot be completely fulfilled for many years, of itself is a powerful force for attracting the means necessary to fulfill the need.

"Progress in the nation requires all products of the construction industry, from more efficient factories, dams, pipe lines, docks, highways, research laboratories, schools, and stores to new homes.

"To solve the housing problem, and to fulfill the other construction needs of the country, a greater volume of construction is necessary than ever before.

"The recommendation of the association is that to assure maximum speed, efficiency, and economy in the construction of housing, and all other projects vital to development of the nation, governmental attempts to control and direct operations of the construction industry be abolished immediately."

Commissions Offered in Navy C. E. Corps

APPLICATIONS ARE now being accepted for commissions in the Civil Engineer Corps of the Regular Navy. To qualify, applicants must be graduates of an accredited college or university with a scientific degree in engineering and have had professional experience in engineering or related active military service since receiving a degree. Age limitations are not less than 22 nor more than 30 years of age. Additional qualifications include 10 years of citizenship and the successful completion of physical and professional examinations. Candidates will be given indoctrination training at the Civil Engineer Corps Officers School, Port Hueneme, Calif.

Applications and further information may be obtained from the Office of Naval Officer Procurement, 210 West 7th Street, Los Angeles 14, Calif.

New Institute Will Conduct Building Products Research

FACT-FINDING and economic research in the field of building materials and equipment are the functions of an organization that has been founded by representatives of 200 companies and associations engaged in the manufacture of such materials and equipment.

Douglas Whitlock, formerly chairman of the advisory board of the Producers' Council, was elected chairman of the group, to be known as the Building Products Institute. In announcing the formation of the institute, Mr. Whitlock stated that other manufacturers and associations interested in the construction industry will be invited to join.

"The purpose of the institute," he said, "is to assemble, analyze, and disseminate facts about the production of building materials and equipment and about the progress of construction, including housing. The institute also will analyze and make recommendations with respect to proposed legislation affecting the construction industry and will cooperate with other branches of the industry in preparing recommendations designed to stimulate a maximum volume of construction, to lower the cost of building, and to stabilize construction activity. In addition the institute will study the effects of existing federal controls under which the building industry now operates.

"Emphasis will be placed on the collection of facts and figures with which to check and verify statistical information released by various federal agencies with respect to construction trends and activity. The services of nationally known consultants will be retained. Miles L. Colean, former assistant administrator of the Federal Housing Administration, will be the institute's economic consultant."

The offices of the institute will be at 1756 K Street, N.W., Washington 6, D.C.

Vice-President McNew Recovering from Illness

WORD HAS BEEN received at Society headquarters that J. T. L. McNew, Vice-President of the Society, is recovering from a cerebral hemorrhage, which he suffered at his office in College Station, Tex., on November 11. Colonel McNew's friends on the Society staff join with the many members who know him in wishing him a complete and speedy recovery.

A former Director of the Society (1942–1944), Colonel McNew served as an engineer with the Army Air Forces in the C. B. I. theater during the war, and is now vice-president of engineering at Texas A. & M. College.

Reduction of Housing Costs Discussed at ASME Meeting

INCREASED PRODUCTION of permanent-quality housing is possible by more efficient use of materials and increased output of labor, according to Prof. Walter C. Voss, Assoc. M. ASCE, head of the department of building engineering and construction, Massachusetts Institute of Technology. This opinion was expressed by Professor Voss at the wood industries session of the fall meeting of the American Society of Mechanical Engineers at the Hotel Statler, Boston, Mass., September 30.

"Obstructions in the path of solving the problem will arise from inadequate building codes, unusually strict zoning codes and a gradually crystallizing labor union policy which may increase costs," Professor Voss said. "Our present use of auxiliary materials is exceedingly wasteful not only from the standpoint of their more efficient use due to technical advances, but also because we have grown up in an atmosphere of testing individual structural members instead of completed structures to determine their efficacy."

"The present tendency of labor unions is to assume that as long as a workman is a member of a certain union he merits the same reward as all other members," Professor Voss said. "This would be entirely fair if the unions were as meticulous in accepting new members as, for example, the engineering societies or the medical and legal professions. This is not true and there is no attempt at grading or classification according to skill in any one trade, aside from the relation which now exists between the journeymen and the apprentices."

"No group should be able, because of legal procedure, to paralyze the stream of production or to increase unreasonably the costs of production," he continued. "The time has come for the employer and employee to jointly take responsibility for production and as a result to share in the fruits of such production. This means that lower hourly wages based upon continuous employment and participation in the profits of the corporation as incentive bonuses should be instituted.

"It is imperative that we use all of our materials as economically as possible; that we revise our concepts of acceptability by viewing the end product rather than the individual element; that labor be sufficiently interested in securing its own economic status by doing a good day's work for a reasonable wage; that employers and employees alike recognize their partnership in their efforts so that they may serve the public and thereby serve their own ends; and that all of us remember that the depression of one of the groups in our society ultimately means depression for all."

Fall Meeting of ASEE Is Scheduled for Wilmington

THE AMERICAN SOCIETY for Engineering Education (formerly the Society for the Promotion of Engineering Education, or SPEE) will hold its fall meeting in the Nemours Building, Wilmington, Del., on Saturday, December 7. This is at the invitation of E. I. du Pont de Nemours & Co., of that city.

EJC Nominated to UNESCO Advisory Body

THE National Commission for Educational, Scientific and Cultural Cooperation has nominated Engineers Joint Council to one of ten remaining seats. The EJC, although a participant in the work of the Commission since it was proposed in April 1945 (September 1946 CIVIL ENGINEERING, page 415), was omitted from the original list of 50 nongovernment organizations chosen to send representatives to its first meeting in Washington, D.C., September 23–26, 1946. In the elections to be held in February 1947, organizations to hold the ten remainingseats will be determined.

The National Commission is a nongovernmental organization set up by the Department of State as a link between U.S. citizens and the international body, UNESCO (United Nations Educational, Scientific and Cultural Organization).

Representation by EJC on this Commission would give engineers a voice in its deliberations.

Small Cities Will Have Opportunity for Airports

UNDER THE Civil Aeronautics Administration's postwar federal-aid airport-development program, the smaller communities of the country will have as good a break as metropolitan centers, Walter R. Macatee, manager of the airport division of the American Road Builders' Association, pointed out in a recent address before a group of air officials. It is likely that more than 50 percent of the airfields under consideration will be located in cities of less than 25,000 population. "The Federal-Aid Airport Act authorizes a half-billion dollars, on a fifty-fifty matching basis for the construction phase of Class III and smaller airports, to be extended over a period of seven years," he said.

"Requests for information arriving in Washington from cities of all sizes indicate a deluge of applications later on," Mr. Macatee stated, pointing out that the CAA, at this time, wants to know what cities are interested. "Municipal air-mindedness does not depend on size," he said. "If a community really wants an airport, action at this time is indicated. Eight definite steps are required to complete arrangements leading to the actual granting of federal-aid funds, which are apportioned to the states on the basis of their relative population and area."

Army Public Relations Publishes Aurand's Address

EXCERPTS FROM the address of Maj. Gen. H. S. Aurand, presented at the Kansas City meeting of ASCE and used as the lead article in the November issue of CIVIL ENGINEERING, have been mimeographed by the Public Relations Division of the War Department. Copies may be secured on request to the War Department, Public Relations Division, News Branch, Publications Section, Box BPR, The Pentagon, Washington 25, D.C.

Strikes, Boycott, Closed-Shop Issue Harass West Coast Engineers

(*Continued from page 539*)

affiliated building trades craft unions in pulling a secondary strike. The San Francisco Building Trades Council has not been sympathetic to either strikes or boycotts involving Local 89.

ENGINEERING EMPLOYERS ORGANIZE

Owing to the pressure of the drive by Local 89 to establish closed union shops in the East Bay engineering offices, 43 firms, all employers of engineers and surveyors, in March 1946, formed the Bay Counties Civil Engineers and Land Surveyors Association, Inc. The Association engaged an executive secretary, Milton Morris, to represent it in negotiations with the A. F. of L. union. One of the purposes of the Association is to handle collective bargaining problems on a group basis with their employees. The members of the Association determined not to sign individual contracts with the union, but if acceptable, the contract would be a group contract between the Association and the representative of its collective employees.

The business agent of Local 89, Mr. Johnson, approached Mr. Morris with a union-shop contract which the Association declined to sign. The Association expressed willingness to negotiate if the union would establish itself as the bargaining representative by a consent election of the employees, the election to be conducted by the San Francisco office of the National Labor Relations Board. This issue Mr. Johnson refused.

The business representative of the Alameda Building Trades Council, J. C. Reynolds, notified the Association that the Council had authorized strike action against any members of the Association who refused to sign individual contracts with the union and had instructed him to support the union's activities.

On April 22, 1946, the office of A. M. Betaque, an Oakland member of the Association, was struck and a picket line established in front of his office. Mr. Betaque had four employees, three of them members of Local 89. His clients were informed by the Building Trades Council that he had been placed on the union's unfair list. They concluded that crafts union men would not construct homes on property for which he had set boundary stakes. Pickets stopped house movers from moving a house onto property where he had set the property corners. Unable to obtain replacements from other sources, or to continue operations independently, his work was carried on in cooperation with other firms who are members of the Association.

CONCILIATION REQUESTED

As a result of this strike Mr. Johnson reported a labor disturbance on April 30 to the U.S. Conciliation Service in San Francisco, and requested the assignment of a commissioner to conciliate the differences between the union and the Association. Commissioner L. L. Livingston, on May 10, 1946, met with a Committee of the Association, Mr. Reynolds of the Alameda Building Trades Council, and Mr. Johnson of Local 89. On behalf of the Association, Mr. Morris proposed an agreement that the union would represent all employees who were members of Local 89 and that all employees who were then members of the union would continue their membership for the life of the agreement. The union wage scale was not an issue because members of the Association were paying equal or better salaries than those called for by the union scale.

The proposal was not satisfactory to the union. It demanded, instead, a master contract with the Association, or individual contracts with the members, which would provide for a complete union closed shop, with hiring through the union.

Pending a reply from the Association to the union's closed-shop proposal, the Association requested the removal of the picket line about Mr. Betaque's office. The request was promptly denied by the union. Mr. Reynolds stated that the picket line was approved by the Building Trades Council of Alameda County and would not be removed until satisfactory agreement had been reached either with the Association or with Mr. Betaque himself.

After the meeting of May 10, both the union and the Alameda Building Trades Council extended their economic action to other firms: J. Y. Long Co., Engineers, and the J. W. Wilson Co., both of Oakland. Picket lines were placed around one of these offices and some of their construction jobs. The Council notified clients of these firms that they had been placed on the unfair list. One of these firms had but one union employee among the twelve on its staff. The union employee reported for work daily with the non-union employees as if no strike had been called.

One client of the J. Y. Long Co., Engineers, was a building contractor and subdivider without an engineering force. When his 200-home subdivision project was well along, Local 89 demanded that the contractor switch his engineering from the Long Co. to a firm having an agreement with the union or suffer a stoppage of construction work. No other firm could be found to take over the engineering and J. Y. Long, Assoc. M. ASCE, declined to sign a union-shop agreement. Local 89 and the contractor compromised by signing a one-year agreement for a closed shop on his future engineering work, but the agreement permitted the Long Co. to complete the project without further intimidation. Similar economic pressure was exerted against other developers.

STRIKE IS SANCTIONED

In Marin County another engineering firm that refused to sign the union's closed-shop contract was struck. J. C. Oglesby, struck on May 27, had four out of 15 employees who were members of the union. This strike was sanctioned by the Building Trades Council of Marin County (George R. Scott, secretary). Mr. Johnson personally advised Mr. Oglesby's employees not to work on the day of the strike and promised to place non-union employees elsewhere if they would strike in sympathy with the union employees. When they continued to work, some of them were ordered off several of Mr. Oglesby's projects under threat of physical violence. They continued necessary work on other projects of their employer. Contractors employing Mr. Oglesby's firm were advised by Local 89 and the Council to discontinue the firm's services or suffer a secondary strike to be effected by calling the allied building crafts union men off their construction jobs.

At another meeting in the office of the U.S. Conciliation Service on June 7, 1946, the union reiterated its demand for a closed-shop agreement. The Association stated its stand that its employees were hired because of their qualifications to perform the service required, not because of membership in any organization. The employers' Association contended that the union had never demonstrated its ability to supply all types of trained technical and professional employees nor had the union established itself as the bargaining agent of a majority of the employees it sought to represent. The Association rejected the union's proposals; negotiations were broken off, and no agreement has been signed between the union and the Association. The picket lines have not been withdrawn officially, but have dissolved by attrition.

The Contra Costa Building and Construction Tr des Council, Howard Reed, business representative, under date of June 21, 1946, addressed letters to contractors and other clients of engineering firms in the county advising that a labor controversy existed between Local 89 and the civil engineering firms in the county. It called attention to the standard agreement of the Council, which provides that all future building operations, maintenance, and work by contract or subcontract be performed by union members working union hours under wage scales and working conditions set by the various crafts affiliated with the Council. The letter stated further:

> "It is our desire that vital construction work in this area continue without interruption. We therefore request that you secure your civil engineering employees from the above-named union or have your work done by a firm which is under agreement with the Technical Engineers' Union. The following firms have signed agreements with the above named union:" The list followed.

PROFESSIONAL GROUPS FORMED

In the San Francisco Bay Area, professional engineering employees who desired their representative to be of their own choosing and to have their collective bargaining done for them on a professional level joined in December 1944 with architects, chemists, and industrial scientists to form the San Francisco Area Group of Professional Employees. Its bargaining units are in the engineering departments of several East Bay industrial engineering establishments and in a public utility district. Among the 280 engineering employees of the Bay

Counties Civil Engineers & Land Surveyors Association, Inc., it has more than 50 members—enough to claim a substantial interest in the outcome of the labor controversy between Local 89 and the Association. It indicated this interest when, on May 14, 1946, its secretary, Howard S. Lane, submitted a proposed agreement to the Association which would recognize the group as the sole collective bargaining representative of the Association's employees, and would establish a position classification and salary schedule. The agreement makes no reference to employee membership in any organization. Because of its controversy with Local 89, the Association was unable to show preference to any parties claiming to represent its employees and was barred from signing the contract.

Still another employee organization of engineers, architects, scientists, and allied technicians, the San Francisco Bay Chapter of the Engineers and Architects Association, is interested in representing the employees of the Bay Counties Civil Engineers and Land Surveyors Association, Inc. It also has more than 50 members among the 280 employees sought to be represented. On June 6, 1946, its chairman, Charles T. Ledden, officially petitioned the National Labor Relations Board for a hearing in the case, for the delineation of an appropriate bargaining unit, and for a direction of election by the employees to designate their choice of a representative.

The Board promptly notified all interested parties that a petition had been filed and requested them to submit any evidence they desired to justify their intervention at the hearing. Both Local 89 and the San Francisco Area Group of Professional Employees filed necessary evidence of interest with the Board and became interveners.

THREE CLAIM RIGHTS

This action will place three claimants for bargaining rights on the ballot when the election is directed by the Board. The issue is out of the strike, intimidation, boycott, and picket-line stage and is under study by the Board's field examiner. To be successful in the election, one of the contestants must receive a majority of all the votes cast. Three campaigns for members and for votes are under way.

In his report in "The Wagner Act: After Ten Years," Lee H. Hill, former member for industry on the National War Labor Board stated:

> "It is time we paid more attention to some of the abuses which have become attached to labor's right to strike. Here are some of the strikes which can hardly be justified on any basis of public policy: sympathetic strikes, strikes against the government, strikes to force recognition, jurisdictional strikes, and strikes not voted by a majority of the employees. . . . No union or individual should be permitted to use force, coercion, or intimidation to prevent other individuals from working if they choose to work."

A former member of the National Labor Relations Board, Gerald Reilly proposes that the Board be empowered to obtain court injunctions to prohibit unions from conducting secondary boycotts. On refusal to comply with the injunction the court could jail the responsible officials for contempt. This view appears to be concurred in by Paul M. Herzog and John M. Houston, both members of the present three-man Board, who believe, however, that before the Board could act in this manner the Wagner Act and the Norris-LaGuardia Anti-Injunction Act would have to be amended.

The engineering profession has an opportunity, through Engineers Joint Council, and an obligation to impress its convictions on Congress as a matter that concerns them not only as professional engineers but as citizens.

Highway Research Board Schedules Annual Meeting

A FULL PROGRAM of technical and scientific papers is being scheduled for the 26th annual meeting of the Highway Research Board of the National Research Council. Headquarters for the meeting will be the building of the National Academy of Sciences—National Research Council, 2101 Constitution Avenue, Washington, D.C., and the dates are December 5 to 8, inclusive.

Airport Facilities Paper Available in Complete Form

READERS INTERESTED in the article by E. H. Sittner, "Owner-Operator Cooperation Essential to Maximum Use of Airport Facilities," which appeared in the November issue of CIVIL ENGINEERING, may wish to procure mimeographed copies of the paper in its complete form. The article in CIVIL ENGINEERING was a shortened form of the paper presented before the Air Transport Division at ASCE's Fall Meeting in Kansas City.

Mimeographed copies will be sent free of charge as long as the supply lasts on request to John McGowan, secretary, Executive Committee of the Air Transport Division. His address is The Thompson Manufacturing Co., 3001 Larimer Street, Denver 3, Colo.

Aluminum Span Carries Rail Traffic Over Grasse Bridge

(Continued from page 531)

compound known as Alumilastic, which is of a paint-like consistency but which does not entirely dry out even over long periods of time. This treatment was used to prevent moisture from entering and standing in the joints for long periods of time. General experience has been that if corrosion of the joints can be prevented there is little need to worry about the rest of the structure. This treatment of the joints is also somewhat experimental in nature and forms a part of the test of this aluminum paint.

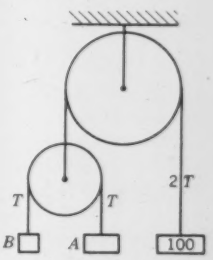
N. G. Neare's Column

Conducted by

R. ROBINSON ROWE, M. ASCE

"DON'T LOOK AT ME," begged Professor Neare as the Engineers Club leaned back from the dinner table for the regular puzzle session. "Guest Professor Isidore Knobbe is going to finish what he started last October."

"Noah refers to the system of 2 pulleys and 3 unequal weights with equal momenta," explained Professor Knobbe. "Remember this sketch?"



"It's haunted me for two months," complained Joe Kerr. "I set up a lot of kinematic equations from which I could solve everything but the required weights. The time canceled out and so did g, leaving me one quartic in 2 unknowns."

"I did a little better," said Ken Bridgewater. "My quartic gave me one redundant, one solution with negative weight and two solutions with equal weights. Altho you have ruled them out, the latter are $A = B = 50$ and no motion, and $A = B = 100$ at one-third gravity. I tried to justify the negative weight solution with a balloon, but it wouldn't push on the rope."

"Joe and Ken are trying too hard," concluded Cal Klater. "Momentum of a body starting from rest under constant force can be expressed:

$$M = mv = mat = ft = 2Ws/gt \quad . \quad . \quad (1)$$

and equal momenta for 3 bodies means equal f and equal Ws.

So $f = A - T = T - B = 100 - 2T$. (2)

Whence $3A + B = 200$ . . . . (3)

Now the left pulley moves upward the same distance that the 100-lb weight moves down, and this distance is the mean of the distances traveled *upward* by the unknown weights. Ws being the same for each, we can substitute reciprocals of weights for distance algebraically, and write:

$$\frac{1}{100} = \frac{1}{2}\left(\frac{1}{B} - \frac{1}{A}\right) \quad . \quad . \quad . \quad (4)$$

Then from Eqs. 3 and 4 we obtain a quadratic from which

$$A = 100/\sqrt{3} = 57.74 \text{ lb}$$
$$B = 100(2 - \sqrt{3}) = 26.79 \text{ lb.}"$$

"I hoped you would work it that way," said Professor Knobbe, clapping his hands. "The old school teaches that you have to fill the paper with W/g and some moderns would use slugs instead of poundals, but your Eq. 2 is sound if you think of weight as an effective force."

"Thanks, Isidore, for an effectively

forceful lesson in simplified kinematics. Guest Professor Steinmance has promised a new problem in simplified graphics."

"Simplified in one way only, Noah. I was watching a young draftsman working this problem with a compass and a 30–60-deg. triangle: 'Given two corners of a square, to find the other two corners and the center.' I asked him why he used both tools when one would do, and he asked me which one. I advised the easier one and left him to figure that out. If you can't, I'll bring him along in February for a demonstration."

[*Cal Klaters were Samuel J. Loring, Elihu Geer, Richard Jenney, and the still anonymous A Nuther Nutt. Guest Professors were Joseph S. Lambie and D. B. Steinman.*]

N.Y. State Board of P.E. Examiners Makes Report

DURING THE YEAR starting July 1, 1945, and ending June 30, 1946, the New York State Board of Examiners of Professional Engineers held eight meetings and considered 1,684 applications for license. Of these, 61 were rejected, 828 held for final examinations, 91 assigned to preliminary examinations, 99 held for further consideration, 86 certified as having passed the preliminary examinations, 268 licensed by examination, and 251 licensed on record and experience (including registrants in other states).

Of the 73 candidates who took the preliminary examinations for engineers-in-training in New York State in June 1946, 56 passed and were certified. This brings the total of certified engineers-in-training in the state to 284. No charges were filed seeking the revocation of any licenses, and no amendments were made to the Engineers' Law.

Chairman of the State Board of Engineers is D. B. Steinman, M. ASCE. Other officers are Newell L. Nussbaumer, M. ASCE, vice-chairman; Newell L. Freeman, secretary; and Erich Hausmann and Leigh E. St. John.

Merger of Two Army Divisions Announced

THROUGH THE Office of the Chief of Engineers, the War Department has announced the merger of the Middle Atlantic Division with the North Atlantic Division. The Middle Atlantic Division, comprising the Baltimore, Washington, and Norfolk District Engineer Offices, with headquarters in Baltimore, was created during the war to supplement the activities of the North Atlantic Division and the South Atlantic Division.

Under the consolidation, the functions of the two divisions will be combined in New York City under the command of Col. B. C. Dunn, division engineer. The new North Atlantic Division will consist of the New York, Philadelphia, Baltimore, Washington, and Norfolk Districts.

From April 1942 until January 1944, Colonel Dunn was division engineer for the North Atlantic Division. During the past 3 years he has served overseas as deputy chief engineer at Supreme Headquarters, having the rank of brigadier general, and more recently was division engineer for the Ohio River Division.

ASCE Members Prepare Municipal Airport Plan

AVAILABLE for use by engineers and others charged with the task of preparing plans for municipal airports in difficult and isolated terrain is "A Master Plan for the Bradford (Pa.) Municipal Airport." The 62-page report is confined to a study of the airport site as it now exists and the development of the site to provide the area with a community owned and operated airport fitting the needs of the area.

The report was prepared by Michael Baker, Jr., C. F. Eben, and R. L. John, Associate Members ASCE, and D. A. Warnick, Jun. ASCE. All are connected with the Baker Engineers, of Rochester, Pa. A copy of the report has been filed in the Engineering Societies Library.

Engineering Section of AAAS to Meet in December

A TWO-DAY PROGRAM of papers will feature the sessions of Section "M" Engineering, of the American Association for the Advancement of Science, on the occasion of the association's annual meeting. The dates are Saturday, December 28, and Monday, December 30, and the place is the Massachusetts Institute of Technology, Room 250, Building 10.

The local committee of Section "M" in charge of the meeting includes several ASCE members. Its personnel is: Dean G. M. Fair, M. ASCE, chairman, Harvard Engineering School; Prof. Albert Haertlein, M. and Director, ASCE, president, Engineering Societies of New England; Dean T. K. Sherwood, M.I.T.; Dean H. P. Burden, Assoc. M. ASCE, Tufts College; Dean W. C. White, Northeastern University; and N. Boynton, Jr., president, Boston Engineers Club. Frank D. Carvin, Newark College of Engineering, is secretary.

Meeting headquarters for Section "M" will be the Kenmore Hotel, and requests for reservations should be sent to the AAAS Housing Bureau, Convention Bureau, Chamber of Commerce, 80 Federal Street, Boston 10, Mass.

Construction Volume Up 25 Percent in 1947

CONSTRUCTION VOLUME in the 37 states east of the Rocky Mountains will increase approximately 25 percent in 1947 over that in 1946, according to the estimate of Thomas S. Holden, president of F. W. Dodge Corp., a fact-finding organization for the construction industry. The Dodge executive indicated that 630,000 dwelling units would be built in the states east of the Rockies in 1947, a gain of 35 percent in number and 38 percent in dollar volume over the expected 1946 record. The residential estimates assume, he said, that the present system of priorities and allocations of materials will be out.

An anticipated gain of 7 percent in nonresidential construction, such as commercial, industrial, and educational building, and 22 percent in public works and utilities during the coming year, added to the increased residential volume, would bring the total of all construction in the 37 states to slightly more than $9,500,000,000 as compared to the $7,700,000,000 total expected for 1946.

Many Veterans Choose Engineering as Goal

NEARLY ONE out of every ten veterans enrolled in educational institutions under the G.I. Bill selected engineering as his training objective, according to a Veterans Administration survey of veterans in school at the end of the first half of 1946.

Of the total of 612,690 veterans in classrooms on June 30, 57,241—or 9.34 per cent—were enrolled in engineering courses. More than 54,000 were attending institutions of higher education, while 2,832 were in vocational schools and 181 in secondary schools. By September 30, the total number of veterans in school under the G.I. Bill rose to 742,064.

Veterans are eligible for education under the G.I. Bill if they saw 90 days or more of active military service, part of which was after September 16, 1940, and were discharged under conditions other than dishonorable. They are eligible for a maximum of 4 years of schooling, during which time they receive a subsistence allowance of $65 a month if single, or $90 a month if they have dependents.

Building Officials Foundation Established

THE Building Officials Conference of America—composed of municipal building officials charged with the administration of building codes, laws and regulations—established the Building Officials Foundation at its recent annual meeting, held in Memphis, Tenn. The organization was founded to bring order out of the chaos attending the administration and enforcement of local building laws and regulations by supplying building officials with the machinery needed to do a more efficient job in the public interest.

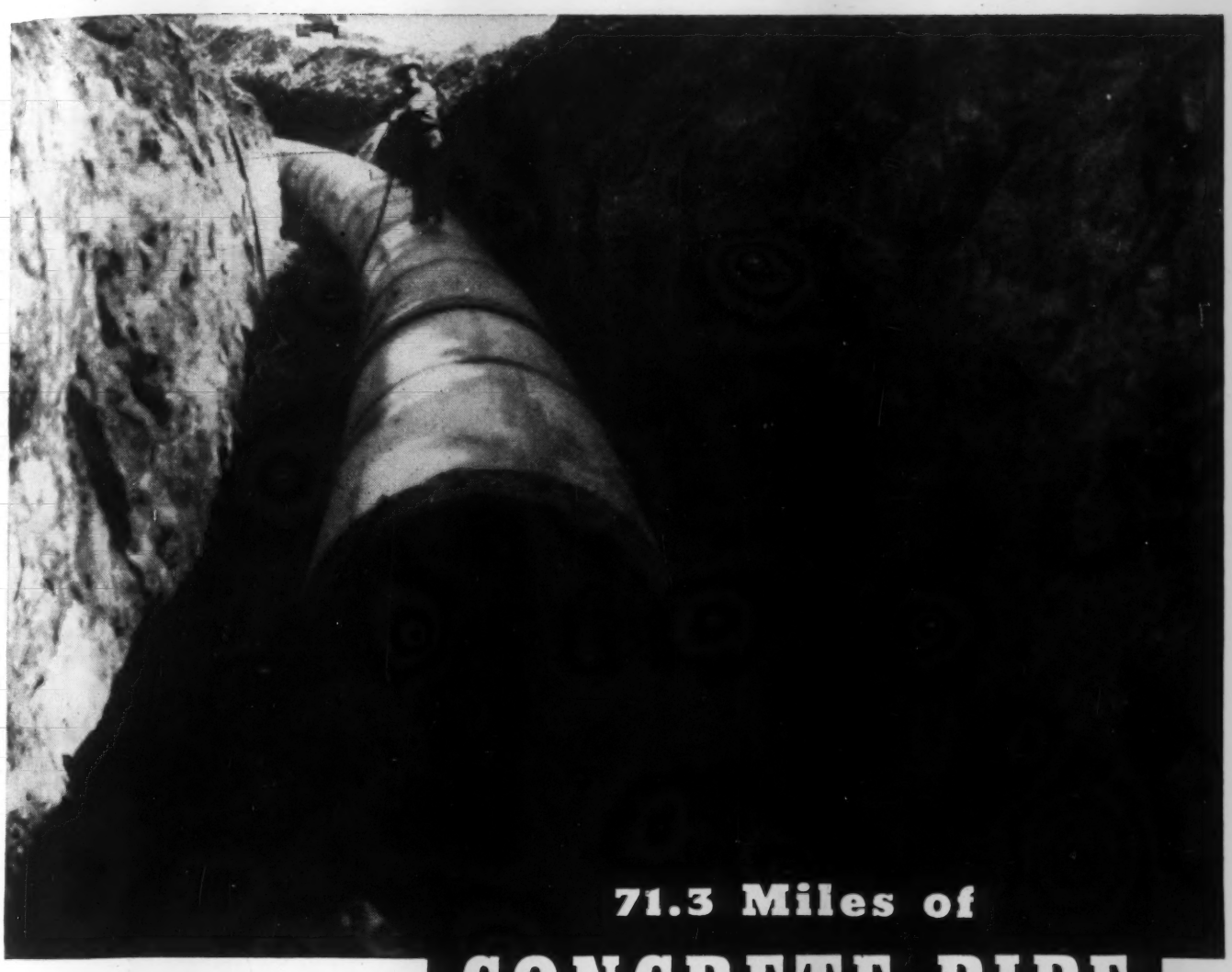
Principal functions of the Building Officials Foundation are:

1. To encourage adoption by all communities of the Basic Building Code promulgated by the Building Officials Conference of America, so that a country-wide uniform code can be established, and to encourage communities to keep their local codes up to date.

2. To assist communities in the administration of their building laws and regulations.

3. To reconcile local building codes with advances in the art of building, so that structural design, equipment, construction materials, and methods may be progressively improved in the public interest.

4. To provide uniform testing procedure in consultation with industry in deter-



54-in. spiral reinforced concrete high pressure pipe being installed for San Diego Aqueduct in a section near Winchester, Calif.

71.3 Miles of CONCRETE PIPE in San Diego Aqueduct

RAPID construction without use of critically scarce materials was a primary requirement for the 71.3 mile gravity flow aqueduct now being built to avert a water shortage in San Diego, Calif.

Reinforced concrete pipe in sizes ranging from 48-in. to 96-in. I.D. are being used to meet this requirement.

The durability, efficiency and economy of concrete pipe for water lines, land drainage, irrigation and sanitary sewers has been demonstrated for more than fifty years.

Technical information on concrete pipe will be furnished without obligation by this Association or any of its members. (List of members on request.)

Construction of this 71.3 mile San Diego Aqueduct is under the supervision of Capt. Alden K. Fogg, Public Works Officer, 11th Naval District. He is assisted by Comdr. R. D. Thorsen, Resident Officer in charge of construction; O. H. Lillard, office engineer; Lt. Comdr. F. M. Hines, northern division, Lt. D. A. Gray, southern division, resident officers. R. B. Ward, Senior Engineer of the U. S. Bureau of Reclamation is consultant on the site.

AMERICAN CONCRETE PIPE ASSOCIATION

228 NORTH LA SALLE STREET CHICAGO 1, ILLINOIS

mining the adequacy of testing equipment, and for evaluation of the integrity of equipment, materials, and methods of construction.

5. To make known to building officials everywhere the results of tests promptly and in a manner compatible with the needs for such data in administering building rules and regulations.

6. To keep building and other municipal officials concerned with public health and safety and all others in any way connected with the building industry informed of advances in building requirements and code administration and to supply them with news, informative articles, and other data pertaining to the art of better building and construction practices.

New in Education

Arkansas State College Engineering Courses Open

TO MEET THE present unprecendented demand for engineering education, Arkansas State College, Jonesboro, Ark., is inaugurating 4-year courses in civil, electrical, and mechanical engineering. Some vacancies still exist, and applications for enrolment are being accepted for the quarter beginning November 29, 1946, and for the 1947 fall semester. The campus has adequate facilities to house single men on a barracks basis in permanent concrete structures.

Arkansas State College is a coeducational institution, established in 1909. However, most of its buildings have been constructed since 1932 and are completely modern in design. In anticipation of capacity enrolment, new laboratory equipment for the engineering departments is being collected and installed.

* * * *

Surplus Buildings Go to Kansas State College

TRANSFER of four government-owned surplus temporary buildings from the Army Air Base, Coffeyville, Kans., to the campus of Kansas State College of Agriculture and Applied Science, Manhattan, Kans., has been approved by Maj. Gen. Philip B. Fleming, M. ASCE, Federal Works Administrator. The buildings will provide facilities needed because of an expected enrolment of 5,800, including 4,300 veterans.

* * * *

Structural Research Gains at Lehigh University

STRUCTURAL RESEARCH at Fritz Engineering Laboratory at Lehigh University, Bethlehem, Pa., has reached an all-time high this year, and will expand to meet postwar demands.

The intensive research program, in cooperation with various industries and national institutes, is being conducted by a nine-man staff as part of Lehigh's Institute of Research. Prof. Hale Sutherland, M. ASCE, head of the department of civil engineering, is director of the laboratory. The work in structures and materials is under the supervision of Dr. Bruce G. Johnston, M. ASCE, associate director of the laboratory.

NEWS OF ENGINEERS

Frederick W. Green has been appointed chief executive officer of the St. Louis, Southwestern (Cotton Belt) Railway Lines, with headquarters at St. Louis. Mr. Green has been with the Cotton Belt since 1916—most recently in the capacity of vice-president.

Linné C. Larson, recently relieved from active duty as a major in the Army Corps of Engineers, has been admitted to partnership in the Los Angeles consulting firm of Taylor and Taylor.

Leonard A. Lovell, of the New York firm of Parsons, Brinckerhoff, Hogan and Macdonald, is now in Cali, Colombia, as project engineer for the firm in charge of hydraulic studies in the Cauca River Basin. The studies, involving flood control, irrigation, and hydroelectric power, are being made for the Department of Valle del Cauca.

Harry H. Hawley has resigned as field engineer for the Bureau of Bridges, Ohio State Highway Department, to accept an associate professorship in engineering drawing at Ohio State University. The civil engineering department at Ohio State has a new member in **Emmett H. Karrer,** formerly field bridge engineer for the Public Roads Administration.

Robert L. Streeter has opened an office in Casper, Wyo., under the firm name of Robert L. Streeter, Engineer, for the general practice of civil, sanitary, and municipal engineering.

John C. Kohl, until lately on active duty in the Navy Civil Engineer Corps, with the rank of lieutenant, has been appointed assistant professor of civil engineering at the University of Michigan. He will teach transportation engineering subjects.

E. George Stern, director of the Virginia Polytechnic Institute Wood Research Laboratory at Blacksburg, Va., has been made associate research professor in engineering, filling one of the four engineering research positions authorized by the last General Assembly of Virginia. In addition to his former duties, he will teach timber engineering to seniors and graduate students.

William E. Johnston has been separated from the service after 5 years of active duty and appointed city manager of McAlester, Okla. His most recent assignment was as post engineer at Fort Custer, Mich., with the rank of lieutenant colonel.

James E. Gibbons, vice-president of the American Surety Company, has been elected a director of the New York engineering and contracting firm of James Stewart & Co.

Ralph C. Sweeney is now district sanitary engineer for the New York State Department of Health, with headquarters at Middletown, N.Y. Until a few months ago Mr. Sweeney was a colonel in the Sanitary Corps of the Army. He served at various headquarters in the United States, England, Africa, Italy, France, and Germany for more than 5 years.

Andrew P. Rollins, Jr., recently returned from overseas service in the Pacific Theater of War, with the rank of lieutenant colonel, has been assigned to the Office of the Chief of Engineers in Washington.

N. H. Collisson, captain, Navy Civil Engineer Corps, has succeeded Admiral Ben Moreell as Coal Mines Administrator for the government operation of the seized bituminous coal mines. He had previously served as deputy administrator and as head of the production and operation section of the Naval Petroleum Plants Office. He has been in the Navy since early in 1942, when he was commissioned a lieutenant and assigned as chief production engineering officer, Office of Procurement and Material, in the Third Naval District. In August 1946 Captain Collisson was awarded the Legion of Merit for "exercising a high degree of industrial managerial ability and marked administrative skill. . ." during his wartime service.

N. H. COLLISSON

A. A. Warlam was recently appointed assistant professor of civil engineering at New York University, where he will teach graduate and undergraduate courses in foundation engineering and soil mechanics. Dr. Warlam will also teach highway and airport engineering and will be in charge of the Soil Mechanics and Highway Laboratories. He was formerly research assistant at Harvard University. Other appointees to the N. Y. U. staff include **Norman Porter** and **Robert H. Cummings,** who will be instructors in civil engineering. Until lately Mr. Porter was in the U.S. Coast and Geodetic Survey, and Mr. Cummings was in the Army Corps of Engineers.

Van Rensselaer P. Saxe, Harry D. Williar, Jr., and **Robert E. Robertson, Jr.,** have established a consulting engineering partnership, to be known as Saxe, Williar and Robertson, with offices in Baltimore. Mr. Saxe has been in private practice in Baltimore since 1920, and Messrs. Williar and Robertson are veterans, recently released from the Engineer Corps.

H. C. Whitehurst, director of highways for the District of Columbia, has been nominated to the office of treasurer of the American Road Builders' Association. Directors for the term ending in 1950 include two ASCE members—**E. R. Needles,** New York consultant, and **Charles M. Upham,** engineer-director of the American Road Builders' Association.

John F. Ripken is now assistant professor of civil engineering at the University of Minnesota's St. Anthony Falls Hydraulics Laboratory. He was formerly research engineer for Columbia University's Division of War Research. Another addition to the University of Minnesota engineering staff is **Henry M. Morris, Jr.,** who will be an instructor in civil engineering.

Rudard A. Jones has been appointed research associate professor in the University of Illinois department of architecture to carry on a newly instituted research project in the planning and design of homes to be heated by coal, in cooperation with Bituminous Coal Research, Inc. Prior to recent service in the Naval Reserve, Professor Jones taught at Kansas State College.

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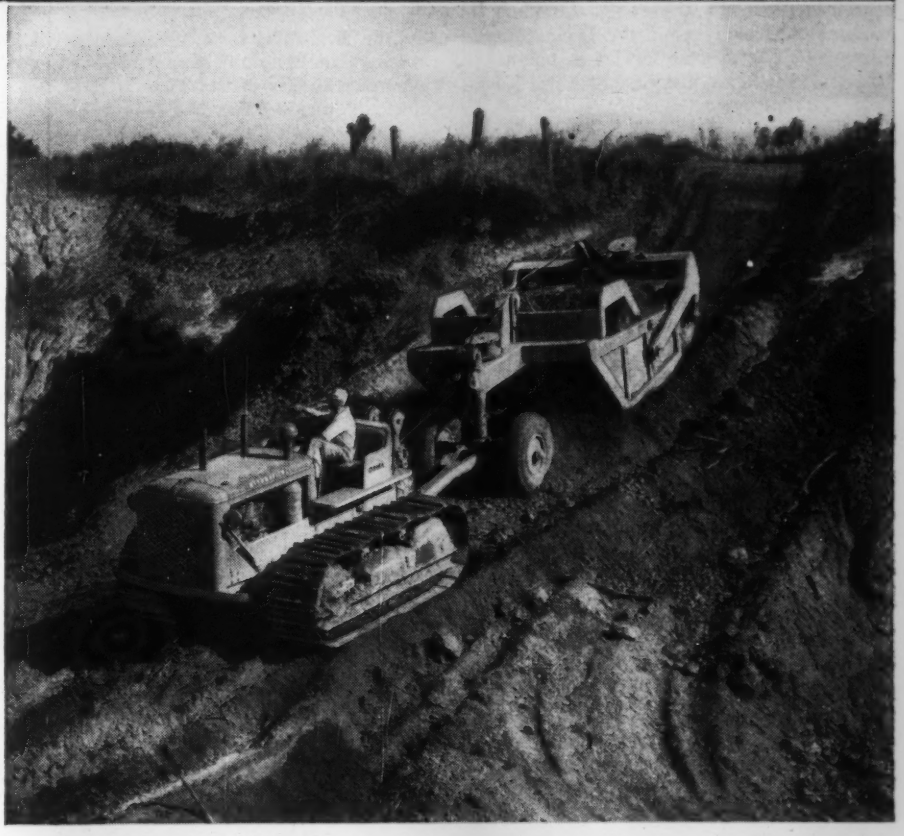

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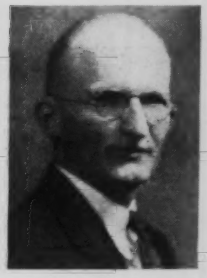
INTERNATIONAL Industrial Power

F. L. CASTLEMAN, JR., has been appointed dean of the school of engineering at the University of Connecticut. Professor Castleman joined the University of Connecticut faculty in 1942, and prior to that was for seven years associate professor of structural engineering at Vanderbilt University. He has been acting dean at the University of Connecticut for more than a year. K. C. TIPPY, formerly associate professor of civil engineering, has been advanced to the position of professor and head of the department.



F. L. CASTLEMAN, JR.

Charles W. Allen, formerly acting chief engineer for the Ohio State Highway Testing Laboratory, is now research engineer for the Ohio State Highway Department, with the job of coordinating and directing all research activities. **Robert R. Litehiser** is back as chief engineer in the Department's Bureau of Tests, after service as colonel in the Army Field Artillery.

Paul W. Holstein, Jr., commander in the Navy Civil Engineer Corps, has returned to the staff of the Commandant, Thirteenth Naval District, Seattle, Wash., after wartime service as officer-in-charge of the Advance Base Depot at Tacoma. His present assignment involves the organization of the postwar Civil Engineer Corps Reserve in the Thirteenth Naval District and the construction of Naval Reserve armories in its larger cities.

George E. Tomlinson has severed his connection with the Tennessee Valley Authority to join the staff of the U.S. Bureau of Reclamation in Washington, D.C. He will be assistant director of the Branch of Project Planning. Mr. Tomlinson has been with the TVA for 13 years, except for a recent wartime assignment as head of the Special Assignments and Reports Section, Office of the Chief of Engineers.

William E. Fox, who left the Structural Design Division of the TVA in July 1942, is back after 4 years of service in the Army and is now in the forecasting section of the Hydraulic Data Division.

John M. Bird was recently transferred from the Office of the Chief of Engineers in Washington, where he served as soil mechanics engineer in the Soils, Geology, and Geophysics Branch, Civil Works Division, to the U.S. District Engineer Office at Los Angeles. As chief of the Soil Mechanics Unit in the district office, he is in charge of all work involving the application of soil mechanics to design.

Howard F. Clark, following his recent discharge from the Army Corps of Engineers, has become connected with the firm of Greeley and Hansen, sanitary and hydraulic engineers, of Chicago. Mr. Clark commanded the 368th Engineer General Service Regiment in the European Theater of Operations, with the rank of colonel.

Andrew P. Rollins and **T. C. Forrest, Jr.,** have dissolved the consulting firm of Rollins and Forrest. Mr. Rollins is now with the Veterans' Administration as chief of the Construction Division of Branch Office No. 10, which supervises all the activities of the Administration for Texas, Louisiana, and Mississippi. Mr. Forrest will continue in active practice in the Praetorian Building, Dallas.

Samuel S. Baxter, projects engineer for the Philadelphia Bureau of Engineering, Surveys and Zoning, was elected president of the American Public Works Association at its recent 1946 congress. The list of new officers includes other ASCE members. These are **E. J. Cleary,** of New York City, Eastern area vice-president, and **George M. Shepard,** of St. Paul, and **W. O. Jones,** of Fort Worth, directors.

Philip X. Navin, previously junior engineer for the Goodyear Aircraft Corp., at Akron, Ohio, has been made field engineer for the New York district of the Goodyear Tire and Rubber Co.

John E. Brumbaugh, until lately village manager of Briarcliff Manor, N.Y., is now general manager of the Tuxedo Park Association, Tuxedo Park, N.Y.

Richard King has resigned as instructor in civil engineering at the University of Texas to accept the position of assistant professor of civil engineering at the University of Michigan. During the war Mr. King served overseas as a captain in the Army Sanitary Corps.

T. D. Lewis, previously with the Yale University Bureau of Highway Traffic, has accepted the position of assistant professor of civil engineering at Cornell University.

Russell L. Culp, until lately designer for the Kansas City firm of Black & Veatch, has accepted the position of city engineer of Garnett, Kans.

John P. Swenson, following his release from the Army Sanitary Corps, has returned to his former position with the engineering and architectural firm of Toltz, King & Day, Inc., St. Paul. Mr. Swenson served with a malaria-control unit on Saipan.

Wilfred W. Baker, who is on the staff of the U.S. Bureau of Reclamation, has been made supervisor of the Bureau's Missouri Basin development program in South Dakota. He was formerly stationed at Tucumcari, N.Mex.

B. F. Soffe, previously district sales manager for the Permutit Company at Detroit, has been appointed district manager of the Lower Michigan district of the Liquid Conditioning Corp., of New York. His headquarters will continue to be in Detroit.

Wallace Chadwick, president of the Los Angeles Section, has been elected president of the Los Angeles Engineering Council of Founder Societies.

Benjamin A. Whisler has resigned as associate professor of civil engineering at Iowa State College to become head of the department of civil engineering and professor of sanitary engineering at Pennsylvania State College. Dr. Whisler was on the faculty of Iowa State from 1936 to 1942, when he enlisted in the Army Sanitary Corps. He saw service in Peru and the Philippines and was relieved from active duty in November 1945, with the rank of lieutenant colonel.

B. A. WHISLER

Bradley G. Seitz has returned to the Syracuse, N.Y., district of the U.S. Engineer Office, after serving for over 3 years in the Army Corps of Engineers.

Abner Gwinn has been appointed chief of state parks by the Missouri State Park Board. For more than 20 years Mr. Gwinn has been in the Missouri State Highway Department.

Carl H. Kadie, Jr., is now district engineer for a newly formed delta district of the Central Valley Project in California, where he will supervise contracts for the purchase of irrigation and municipal and industrial water and power. Mr. Kadie was recently released from the Navy Construction Battalions, with the rank of lieutenant commander.

Walter W. Colpitts, New York City consultant, has been elected a member of the board of governors of his alma mater, McGill University, Montreal.

Albert L. Hertz, following his discharge from the Army Corps of Engineers, in which he had the rank of lieutenant colonel, has returned to his civilian position in the Mobile, Ala., district office of the U.S. Engineer Office.

W. Sherman Smith has been promoted from the position of associate professor of civil engineering at the University of Toledo to that of assistant dean of engineering. Professor Smith has been on the engineering faculty of the university since 1919.

Harry B. Henderlite has resigned as chief engineer of the Louisiana State Highway Department to establish a private practice in Baton Rouge, La. Mr. Henderlite, who has been connected with the department since 1929, will be succeeded by **Norman E. Lant,** for many years bridge engineer.

Nomer Gray is resident engineer for Ammann and Whitney on construction of a hangar, shop, and office buildings for American Airlines at the Chicago Municipal Airport. He was previously in the New York City Department of Public Works.

Russell W. Abbott has been elected president of the Toledo Technical Council for the year 1946–1947.

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Precipitated hardness deposits on the surface of these granules which increase in size. There is no watery sludge; the enlarged granules are readily disposed of like moist sand grains.

Detention period of the Spiractor is only five to ten *minutes*.

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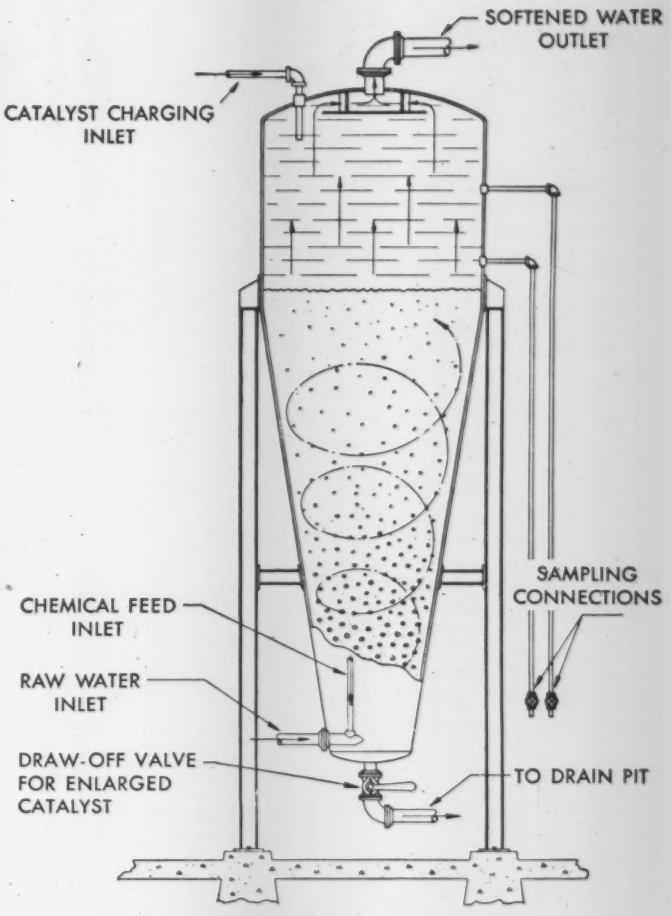
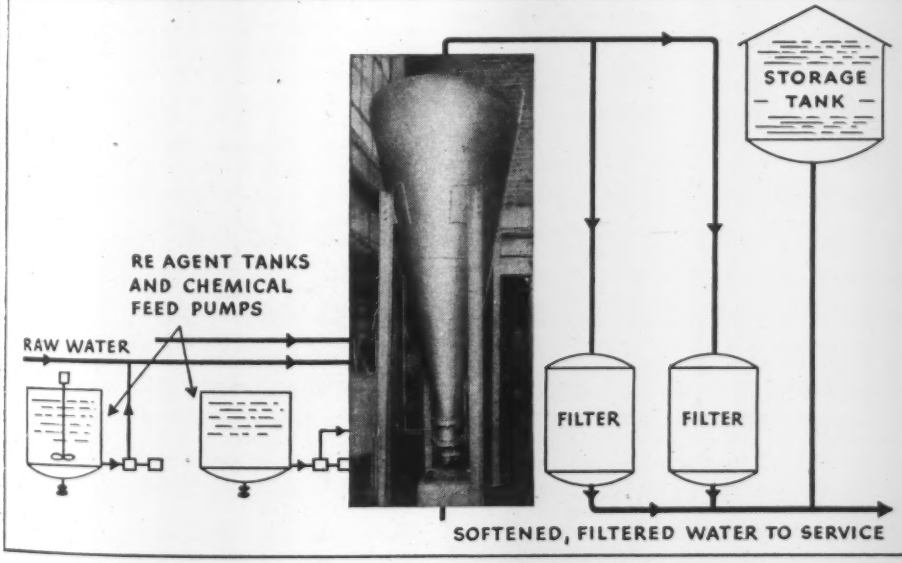


PERMUTIT SPIRACTOR



Municipal Spiractor installation in Illinois, shown semi-diagrammatically. Installation has a capacity of 70 gpm., with a Spiractor 4′ 6″ top diameter by 11′ high. A great number of stability tests were made on the final treated water, by allowing it to stand in closed bottles for 48 hours. Tests indicated that the treated water is clear and remains clear upon standing.

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DECEASED

Bert Orville Bennett (Assoc. M. '25) of the Caruthersville Building Material Co., Caruthersville, Mo., died on September 15. He was 61. From 1909 to 1917, Mr. Bennett was chief engineer of Drainage District No. 8 at Caruthersville. Later he was engineer for Robertson, Carmean–Bennett, paving contractors, and from 1928 to 1943 he was sales engineer and Arkansas representative for the Missouri Portland Cement Co., with headquarters in Little Rock.

Irving Leo Gill (M. '36) retired captain, U.S. Coast Guard, Washington, D.C., died at his home there on October 20. Mr. Gill, who was 63, was in the U.S. Lighthouse Service from 1909 to 1939. He had been superintendent of the 4th Lighthouse District at Philadelphia and of the 15th District at St. Louis, and chief of the Signal Division of the Bureau of Lighthouses. In 1939 he transferred to the Coast Guard as chief of the Radio Engineering Section, and during the war was responsible for the installation and administration of loran as a navigational aid for the Navy.

Augustus Griffin (M. '17) manager of the Department of Natural Resources of the Canadian Pacific Railway, at Calgary, Alberta, Canada, died suddenly at his home in that city on October 13. He was 63. Born and educated in the United States, Mr. Griffin spent his early engineering career here—with the Modesto (Calif.) Irrigation District, and on other irrigation and reclamation projects in California. In 1918 he went to Canada as superintendent of the Eastern Irrigation Section of the Canadian Pacific Railway. From 1931 to 1941 he was chief engineer of the Division of Natural Resources, and in the latter year he became manager. An expert in irrigation and in the design and construction of hydraulic-fill dams, Mr. Griffin devised a widely used method of installing large culverts under highways and railways by a jacking process.

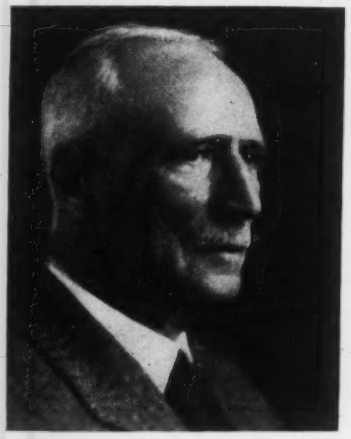
George Dallas Dixon Kirkpatrick (Assoc. M. '13) civil engineer of Salt Lake City, Utah, died in a hospital there on September 29. He was 67. Beginning in 1904, Mr. Dixon was for many years in the U.S. General Land Office. As assistant supervisor of surveys, he was a member of the survey party charged with establishing the international boundary between New Mexico and Mexico. Of more recent years he had been district cadastral engineer at Salt Lake City.

Edward Stabler Lanphier (M. '25) retired superintendent of lighthouses for the 8th District at New Orleans, La., died in that city on October 5. Mr. Lanphier, who was 74, had been with the U.S. Lighthouse Service for 42 years at the time of his retirement in 1938. During this period he was assistant superintendent, first assistant superintendent, and (from 1919 on) superintendent.

George H. Duggan, Hon. M., Killed in Motor Accident

MEMBERS OF THE Society will be grieved to hear of the death of Honorary Member George H. Duggan, chairman of the Board of the Dominion Bridge Co., Montreal, Canada, who was killed in an automobile accident near St. Jerome, Canada, on October 8. He was 84.

Born in Toronto, Mr. Duggan was educated at Upper Canada College and at the University of Toronto, where he completed a postgraduate course in 1884. He became connected with the Dominion Bridge Company in 1886, and from 1891 to 1901 was chief engineer. In the latter year he resigned to become assistant to the president of the Dominion Iron and Steel Company, returning to the Dominion Bridge Company as chief engineer in 1910.



THE LATE GEORGE H. DUGGAN, Honorary Member, ASCE

At that time preliminary work on the Quebec Bridge had just been started. Mr. Duggan was made chief engineer of the newly organized St. Lawrence Bridge Company, and for several years was engaged principally on the construction of the bridge. He was appointed general manager of the Dominion Bridge Company in 1912, vice-president in 1917, and president the following year.

He resigned as president in 1936 to accept the chairmanship of the board of directors. Mr. Duggan was also president of the Dominion Engineering Works, the Robb Engineering Works, the Dominion Welding Co., Charles Walmsley & Co., the Dominion Hoist and Shovel Co., and a number of other allied organizations.

He did much to support and extend the activities of the Engineering Institute of Canada, which he joined in 1888, and in 1937 he was elected an honorary member. In 1936 Mr. Duggan was similarly honored by the ASCE, which he had joined in 1895. His membership in the Institution of Civil Engineers (Great Britain) dates from 1912, and he served on the council of that body in 1918. He was also an officer in the Canadian Mining Institute.

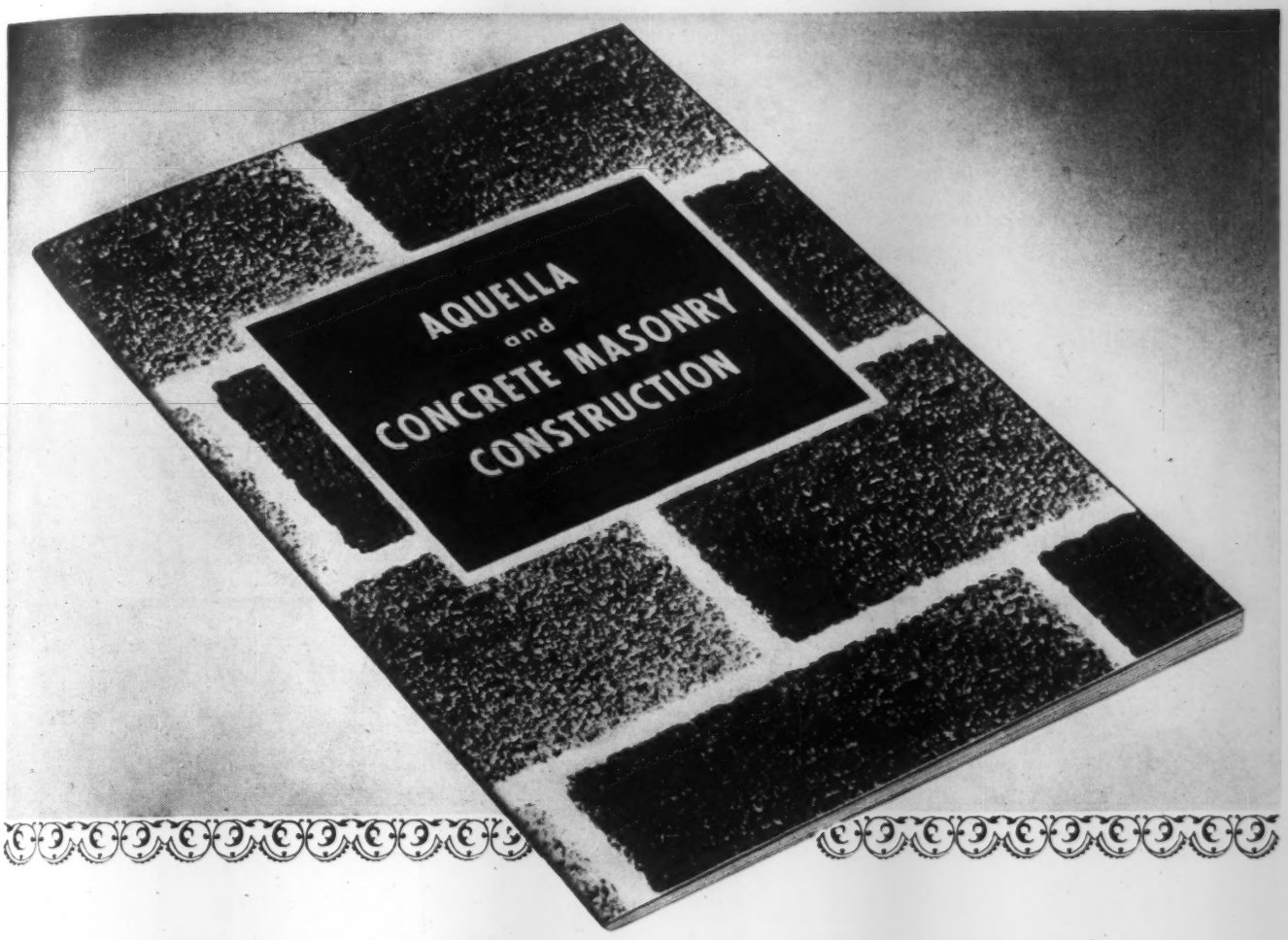
Mr. Duggan was the recipient of the honorary degree of LL.D. from both McGill and Queens universities, and his contributions to engineering progress were recognized by his alma mater in 1920, when the University of Toronto conferred upon him the degree of D.Sc.

Isaac Harby (M. '11) since 1943 supervising engineer for the Defense Plant Corp., Schenectady, N.Y., died at his home in Scarsdale, N.Y., on October 28. Mr. Harby, who was 73, was with John A. Roebling's Sons on the construction of the Williamsburg Bridge in New York and the design and construction of the town of Roebling, N.J. From 1915 to 1929 he was president of the New York construction firm of Harby, Abrons and Melius, Inc. An authority on housing, Mr. Harby had been, in more recent years, with the Resettlement Administration on the Greendale Project near Milwaukee and construction adviser to the U.S. Housing Authority on slum-clearance work. Mr. Harby was a veteran of the Spanish-American War, and during the first World War served as a coordinator of war industries for the U.S. Department of Labor.

Isaac Hausman (Assoc. M. '23) president of the Hausman Steel Company, Toledo, Ohio, died on October 29, at the age of 56. A native of Russia, Mr. Hausman received his engineering education in the United States and spent his career here. From 1911 to 1912 he was with Post and McCord, of New York; from 1912 to 1914, with the Toledo Bridge and Crane Company; and from 1915 to 1925, with the Building Products Company, of Toledo. For the past 20 years he had been president of the Hausman Steel Co.

Neil Cummins Holdredge (M. '23) of Cornwall-on-Hudson, N.Y., died suddenly at his home there on October 10, at the age of 63. From 1906 to 1915 Mr. Holdredge was with the New York Board of Water Supply; from 1915 to 1918, assistant engineer for the Borough President of Manhattan in charge of sewer construction; and from 1919 to 1936, assistant chief engineer for the North Jersey District Water Supply Commission. In the latter year Mr. Holdredge again joined the staff of the New York Board of Water Supply, in the capacity of division engineer for the Newburgh Division. Later he was made department engineer of the Northern Department, supervising construction of the Rondout–West Branch tunnel of the Delaware water supply. Mr. Holdredge retired in June 1944.

Thomas Henry Milford (Assoc. M. '36) chief engineer and director of the Bureau of Sanitation, Alabama State Department of Public Health, Montgomery, Ala., was killed in an automobile accident in that city on November 2. He was 43. Following his graduation from Texas A. & M. College in 1926, Mr. Milford became an assistant sanitary engineer in the Alabama State Health Department. In 1932 he studied at Harvard University and received the degree of M.S. in sanitary engineering. Later he was with the J. W. Goodwin Engineering Co., of Birmingham, returning to the Alabama State Health Department on August 1, 1942, as chief engineer and director of the Bureau of Sanitation.



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Charles Edward Morgan (M. '36) structural engineer for the Portland Cement Association, Chicago, Ill., died on July 28, at the age of 54. Mr. Morgan spent his early career in railroad work and on various construction projects. In 1926 he became connected with the Illinois State Division of Highways where he remained in various capacities until 1937. Since the latter year he had been structural engineer for the Portland Cement Association.

Charles Alfred Paquette (M. '27) president of the Paquette Engineering Corp., Chicago, Ill., died at his summer home in Sturgis, Mich., on July 12. He was 74. From 1902 to 1924 Mr. Paquette was with the Cleveland, Cincinnati, Chicago and St. Louis Railway—from 1915 on in the capacity of chief engineer. From 1924 to 1943 he was president of the M. E. White Company, a Chicago contracting firm, and also consulting engineer for the city of Dayton, Ohio.

Russell Miller Raffensberger (M. '44) district engineer for the American Institute of Steel Construction, Inc., Greensboro, N.C., died on September 15, at the age of 39. From August 1941 to January 1944 Mr. Raffensberger was chief structural engineer on the design and construction of the Marine Corps Air Station at Cherry Point, N.C. Prior to that, he was with the Pennsylvania State Highway Commission and the Georgia Department of Highways.

Melville Emerson Reed (M. '01) of Portland, Ore., died on October 12, at the age of 81. From 1896 to 1911 Mr Reed was with the Great Northern Railway—as assistant engineer on the construction of the Cascade Tunnel for part of this period. Mr. Reed then established a consulting practice in Portland, which he maintained for a number of years. More recently he had been assistant engineer for the Kaiser Company in Portland.

Charles Wesley Schubert (M. '22) engineer of construction for the City of Cleveland, Ohio, died suddenly on February 15, according to word which has just reached the Society. Mr. Schubert, who was 67, had been engineer of construction for Cleveland since 1924. Before that he was for some years in the Cleveland Department of Public Safety, and structural engineer and designer for the Brown Hoisting Machinery Co., of Cleveland. At one time he designed a 34-ft retaining wall of pre-cast concrete units for the Pennsylvania Railroad system at Pittsburgh, Pa.

Harry Archibald Swanson (Assoc. M. '43) assistant professor of civil engineering at North Dakota State College, Fargo, N.Dak., died suddenly on July 6, 1946. His age was 50. Mr. Swanson was in the Fargo Engineering Department from 1926 to 1943—for part of this period in the capacity of assistant city engineer. In 1944 he became a member of the engineering faculty at North Dakota State College.

Changes in Membership Grades

Additions, Transfers, Reinstatements, and Resignations

From October 10 to November 9, 1946, Inclusive

ADDITIONS TO MEMBERSHIP

ABBOTT, ROBERT JEFFERSON, JR. (Jun. '46), Ensign (Supply Corps), U.S.N.R., 2035 East Lakeshore Drive, Baton Rouge, La.

ABEYTA, ABRAN (Assoc. M. '46), Airways Engr., Civ. Aeronautics Administration, P.O. Box 1689 (Res., 2105 Oakwood St.) Fort Worth 11, Tex.

ANDEREGG, RUPERT ANDREW, JR. (Jun. '46), Civ. Engr., Vogt, Ivers, Seaman and Associates, 509 Second National Bank Bldg. (Res., 3429 Berry Ave.), Cincinnati 8, Ohio.

AYER, GORDON ROUNDY (Assoc. M. '46), Hydr. Engr., U.S. Geological Survey, 302 East State St. (Res. 506 South Albany St.), Ithaca, N.Y.

BARKAN, BENEDICT GUNTER (Jun. '46), Junior Planning Asst., Boston City Planning Board, 43 City Hall, Boston (Res., 19 Euston St., Brookline 46), Mass.

BEAM, CHARLES HOWARD (Assoc. M. '46), Project Engr., Bldgs. and Service Design, Gulf Research & Development Co., P.O. Box 2038 (Res., 1559 Marlboro Ave.), Pittsburgh 21, Pa.

BECK, EARL JOSEPH (Jun. '46), Civ. Engr., U.S. Bureau of Reclamation, Gila Project (Res., 318 Fifth Ave.), Yuma, Ariz.

BENTON, PHILIP HENKING (Jun. '46), Asst. Engr., Dames & Moore, 616 West 5th St., Los Angeles (Res., 311 South Alexander, Claremont), Calif.

BLYSTONE, STANLEY EDWARD (Jun. '46), R.D. 1, Wattsburg, Pa.

BOND, ATWELL MADISON (Assoc. M. '46), Instr. Dept. Head., Civ. Eng. Section, War Dept., A.A.F., Care, Officers Training Div., Geiger Field, Wash.

BURFIELD, JAMES ARNOLD (Jun. '46), Insp. of Constr., Dist. Public Works, U.S.N., Inspection Div., 14th Naval Dist., Pearl Harbor, T.H.

CANNON, WILLIAM WAREING (Jun. '46), Sec., Salt Lake Stamp Co. (Marking Devices), 43 West Broadway (Res., 231 D St.), Salt Lake City 3, Utah.

CHURCH, GILBERT PATTERSON (M. '46), Asst. Mgr., Constr. Div., E. I. du Pont de Nemours & Co., Inc., 10504 Nemours Bldg., Wilmington, Del.

CRANFORD, DUNCAN (Affiliate '46), Vice-Pres., Frederick L. Cranford, Inc., 149 Remsen St., Brooklyn 2, N.Y.

DANFORTH, HERMAN LEONARD (Jun. '46), Care, Harland Bartholomew & Associates, 317 North 11th St., St. Louis 1, Mo.

DANIELSON, EARL JUNIOR (Jun. '46), 106 Hoodridge Drive, Pittsburgh 16, Pa.

DAVIS, FRANKLIN NELSON (Jun. '46), 234 North 6th West, Salt Lake City, Utah.

DRISCOLL, JOHN EDWARD (Assoc. M. '46), Research Engr., The Asphalt Inst., 522 Milis Bldg., Washington, D.C. (Res., 4710 South 30th St., Arlington, Va.)

EMMONS, WALTER FRANKLIN (Assoc. M. '46), Asst. Chf., Civ. Design Div., Tennessee Valley Authority, 418 Union Bldg., TVA, Knoxville, Tenn.

FEE, JOHN MACKEY, JR. (Jun. '46), Asst. Highway Engr. (Trainee), State Highway Dept., 213 Smith St. (Res., 155 Main St., South River), N.J.

FEINGOLD, RICHARD MONROE (Jun. '46), Tech. Engr., Jackson & Moreland, Engrs., Park Square Bldg., Boston (Res., 5 Winchester St., Brookline 46), Mass.

FOX, MARK CHARLES (M. '46), Project Mgr., Thompson and Street Co., Gen. Contrs., P.O. Box 393, Beaufort, S.C.

GORKY, HENRY MICHAEL (Jun. '46), Structural Designer, J. Di Stasio & Co., 136 Liberty St. (Res., 1857 Washington Ave.), New York 57, N.Y.

GRAESSLE, HOWARD DAVID, II (Jun. '46), 7025 Arbutus Ave., Huntington Park, Calif.

GREEN, GEORGE PINKNEY (Assoc. M. '46), Hasie & Green Eng. Co., Cons. Engrs. (Res., 2214 Seventeenth St.), Lubbock, Tex.

HANSEN, WAYNE SIMMONDS (Jun. '46), Junior Engr., H. H. Henningson Eng. Co., 18th & Howard, Omaha, Nebr.

HUBBARD, CHARLES COOPER (Jun. '46), Acting Junior Res. Engr., Dist. 14, State Highway Dept. (Res., 518 Fountain Terrace), Austin 21, Tex.

JONES, HENRY CHAPMAN (Jun. '46), Graduate Student, P.O. Box 64, Ithaca, N.Y.

KOBLANSKI, MICHAEL GEORGE (Jun. '46), Student, Columbia Univ., New York, N.Y. (Res., 94 Stevens Ave., Jersey City, N.J.)

LANQUETTE, KENNETH HERBERT (Jun. '46), 28 Overlake Park, Burlington, Vt.

LAUQENOUR, KENNETH CLARK (Assoc. M. '46), 714 West Keystone Ave., Woodland, Calif.

LAURENCOT, RENE EDWARD (Jun. '46), Officer Candidate, U.S. Army, 47 Eightieth St., Brooklyn, N.Y.

LEE, THOMAS BURNS (Jun. '46), Engr., Oman Constr. Co., Box 146 (Res., 102 Woodmont Blvd.), Nashville, Tenn.

LENGYEL, ALBERT (Jun. '46), Draftsman-Detailer, Am. Bridge Co. (Res., 153 Edmond St.), Trenton 9, N.J.

LEVY, LAWRENCE (Jun. '46), Draftsman, Howard, Needles, Tammen and Bergendoff, 55 Liberty St. (Res., 1581 Fulton Ave.), New York 57, N.Y.

LOH, KUO-LIANG (Jun. '46), 112 Chin Tai Road, Hangchow, Chekiang (via Shanghai), China.

LULEY, HOWARD GEORGE (Jun. '46), Design Engr., The Chester Engineers, 210 East Park Way, Pittsburgh 12, Pa.

MOFFAT, ROBERT EMERSON (Jun. '46), Ensign, U.S.N.R., *USS New Jersey* (BB 62), Care, Fleet Post Office, San Francisco, Calif.

NORDSTROM, ROBERT DALE (Jun. '46), Structural Designer, Leland S. Rosener, Cons. Engr., 233 Sansome St. (Res., 306 Park St.), San Francisco 10, Calif.

PAYNE, HAROLD SIMPSON (Jun. '46), 109 Gilmer St., Cartersville, Ga.

PEDDY, JACK ERNEST (Jun. '46), Mathematician, North Am. Aviation, Inc., 5601 West Imperial Highway (Res., 5537 West 116th St.), Los Angeles 45, Calif.

POTTS, ALLEN RIVES (Jun. '46), Asst. Supt., Southern Materials Co., Inc., P.O. Box 42, Hopewell, Va.

RIEDEL, CHARLES ALLEN (M. '46), Chf. Engr., Borough President of Brooklyn, Bureau of Highways and Sewers, Municipal Bldg. (Res., 305 Macon St.), Brooklyn 33, N.Y.

RUFFIN, EDWARD HARRISON (Jun. '46), Engr., Faisant & Kooken, Cons. Engrs., 347 North Charles St. (Res., 3439 Piedmont Ave.), Baltimore 16, Md.

SCHNEIDER, JEROME WILLIAM (Jun. '46), Surveyor's Asst., 1214 Jackson St., Jasper, Ind.

SERR, EUGENE FRANK, III (Jun. '46), Graduate Student and Research Asst., Civ. Eng. Dept., Colorado Agr. and Mech. College (Res., 305 Elizabeth St.), Fort Collins, Colo.

SHERARD, JAMES LEWIS (Jun. '46), 1176 South Van Ness Ave., San Francisco 10, Calif.

TOTAL MEMBERSHIP AS OF NOVEMBER 9, 1946	
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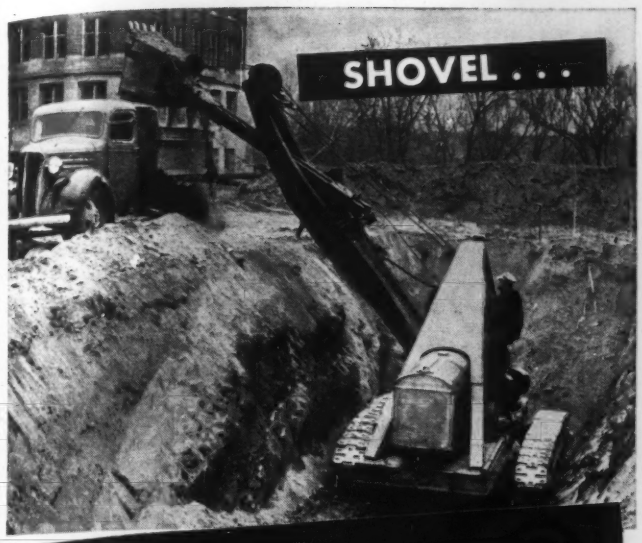
Associate Members	8,248
Corporate Members	14,626
Honorary Members	35
Juniors	6,351
Affiliates	76
Fellows	1
Total	21,089
(November 7, 1945	21,012)



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SKARIN, PHILIP HELGE (Jun. '46), Draftsman II, Los Angeles County Surveyor, 700 Hall of Records (Res., 3748 Fredonia Drive), Los Angeles 28, Calif.

SMITH, EVERETT WILLIAM (M. '46), Vice-Pres., The Philip Carey Mfg. Co., Lockland (Res., Broyton Ave., Wyoming), Ohio.

SMITH, GERALD WOOD (M. '46), Engr.-Special Assignment, Sverdrup & Parcel, Cons. Engrs., 1848 Ry. Exchange Bldg., St. Louis (Res. R.F.D. 13, Box 1555, Kirkwood), Mo.

STANTON, TRAVIS MACKENZIE (Assoc. M. '46), Structural Engr., A. H. Manson, Registered Archt., P.O. Box 188, Christchurch, New Zealand.

STONE, RAYMOND MAURICE (Jan. '46), Design Detail Reinforced Concrete and Structural Steel, Hugh J. Baker & Co., 602 West McCarty (Res., 3015 North Pennsylvania St.), Indianapolis 11, Ind.

TORREGROSA, MIGUEL (Jun. '46), 2 Santa Cecilia St., Ocean Park, Santurce, Puerto Rico.

TURBIAK, WALTER MICHAEL ALBERT (Jun. '46), Structural Civ. Engr., J. Di Stasio & Co., Cons. Engrs., 136 Liberty St. (Res., 235 Dean St., Brooklyn 17), N.Y.

WIERSCHEM, HENRY FRANK (M. '46), Chf. Structural Engr., Lakeside Bridge & Steel Co., 3200 West Villard Ave. (Res., 4116 North 17th St.), Milwaukee 9, Wis.

YOUNG, ROBERT C. (Jun. '46), Ensign, U.S.N.R., *USS EPCE* (R) 855, Care, Fleet Post Office, San Francisco, Calif.

MEMBERSHIP TRANSFERS

AMMANN, WERNER (Jun. '30; Assoc. M. '39; M. '46), Asst. Engr., O. H. Ammann, Cons. Engr., 111 Eighth Ave., New York 11, N.Y.

BURMAN, EDWARD WILLIAM (Jun. '42; Assoc. M. '46), Estimator Engr., Gilbane Building Co., 90 Calvert St., Providence (Res., 281 Kirby Ave., Warwick Neck), R.I.

DURHAM, CHARLES WILLIAM (Jun. '40; Assoc. M. '46), Prin. Civ. Engr., Henningson Eng. Co., Cons. Engrs., 626 Standard Oil Bldg., Omaha, Nebr.

GAHR, WILLIAM NICHOLAS (Jun. '40; Assoc. M. '46), Associate San. Engr., State Health Dept., Bismarck, N.Dak.

GLENDENING, PAUL FREDERICK (Jun '35; Assoc. M. '46), P.O. Box 789, Prescott, Ariz.

GOLLY, MILLIS RAY (Jun. '34; Assoc. M. '46), Senior San. Engr., Div. of San. Eng., State Dept. of Public Health, Springfield, Ill.

HANSEN, RALPH CHRISTIAN (Jun. '33; Assoc. M. '46), Structural Engr., Libbey-Owens-Ford Glass Co., 1701 East Broadway (Res., 3251 Parkwood Ave.), Toledo 10, Ohio.

HOLMES, ROBERT STRATTON (Jun. '38; Assoc. M. '46), Asst. War Dept. Safety Director, Safety Branch, P&A, War Dept., General Staff, Pentagon Bldg., Washington 25, D.C.

IVES, HOWARD SMITH (Assoc. M. '37; M. '46), Project Engr., State Highway Dept., Box 212, Old Lyme, Conn.

MATTERN, DONALD HECKMAN (Jun. '26; Assoc. M. '38; M. '46), Senior Civ. Engr., Tennessee Valley Authority, 517 Union Bldg., Knoxville, Tenn.

PALADINO, PETER ROMEO (Jun. '39; Assoc. M. '46), Constr. Supt., Peter Francese & Son, Inc., 21 North St. (Res., 40 Dartmouth St.), Pittsfield, Mass.

PARK, ARCHIBALD GAVIN (Assoc. M. '34; M. '46), Asst. Constr. Engr., Public Works Dept., Wellington, New Zealand.

ROUSE, HAROLD DOUGLAS (Assoc. M. '41; M. '46), Asst. Supt., Senior Job Methods Engr. (Constr.), E. I. du Pont de Nemours & Co., Inc., Sabine River Works, Orange, Tex.

THOMAS, KEITH DUNLAP (Jun. '43; Assoc. M. '46), (K. D. Thomas Eng. Service), 1040 West Oak St., Stockton, Calif.

WITBECK, HORACE MALCOLM (Jun. '37; Assoc. M. '46), 3724 T St., Sacramento, Calif.

REINSTATEMENTS

ALLIS, JOHN ARTHUR, Assoc. M., Project Supervisor, U.S. Dept. of Agriculture, Soil Conservation Service, Box 741, Hastings, Nebr., reinstated Oct. 24, 1946.

BEHLING, WESLEY A., Jun., 56 West 7th North, Bountiful, Utah, reinstated Oct. 18, 1946.

BOARDMAN, CLIFFORD HOLMES, Assoc. M., Civ. Engr. (Beugler & Boardman), 1419 Broadway, Oakland, Calif., reinstated Oct. 22, 1946.

CHOW, LEE, Assoc. M., Care, Hydr. Dept., Kan-Su Inc., for Agricultural Development, Lan-Chow, Kan-Su, China, reinstated Nov. 7, 1946.

EVANS, JOSEPH SHELTON, JR., Jun., Care, City of Sarasota, Sarasota, Fla., reinstated Oct. 24, 1946.

FILGO, WILLIAM WARD, Jun., Box 272, Jefferson City, Tenn., reinstated Nov. 7, 1946.

HORTH, ROBERT JAMES, Jun., Supt., Central Eng. & Constr. Co., 607 Peoples Bank Bldg. (Res., 3906 Washington Blvd.), Indianapolis, Ind., reinstated Oct. 18, 1946.

LANDAUER, LEO LEVY, Assoc. M., Leo L. Landauer and Associates, Cons. Engrs., 4801 Lemmon Ave. (Res., 4613 West Lovers Lane), Dallas, Tex., reinstated Oct. 22, 1946.

LI, SHU-T'IEN, M., Asst. Prof. of Civ. Eng., Univ. of California, Berkeley, Calif., reinstated Nov. 1, 1946.

LIN, TUNG YEN, Jun., Dean of Eng., College of Eng., National Pei-Yang Univ., Hsi-Ku, Tientsin, China, reinstated Nov. 14, 1946.

LOFGREN, BENJAMIN ELDER, Jun. Graduate Student (part-time faculty member), Univ. of Utah, 79 South 12th East, Salt Lake City, Utah, reinstated Oct. 22, 1946.

MEIKLEJOHN, ROBERT, JR., Jun., Care, Trent Eng. Co., East Troy, Wis., reinstated Oct. 18, 1946.

MESSER, ROY THOMAS, Assoc. M., 3464A South Utah St., Arlington, Va., reinstated Oct. 16, 1946.

MUSE, LEO JACKSON, Assoc. M., Care, College of Eng., Louisiana State Univ., Baton Rouge, La., reinstated Oct. 11, 1946.

NACE, ROBERT Regnault, M., Chf. Eng., Maintenance of Way, the Pennsylvania R.R., New York Zone, Pennsylvania Station, New York 1, N.Y., reinstated Nov. 7, 1946.

PARKER, GEORGE MASON, M., Engr., U.S. Engr. Office, Fort Norfolk, Norfolk 1, Va., reinstated Oct. 11, 1946.

PATTERSON, CHARLES BIRD, Jun., Engr., Chf., Research Center, War Dept., Corps of Engs., Mississippi River Comm., U.S. Waterways Experiment Station, P.O. Box 631, Vicksburg, Miss., reinstated Oct. 28, 1946.

SMYTHE, HAROLD EARLE, Assoc. M., Director, Public Works Dept., Georgetown, Demerara, British Guiana, S.A., reinstated Nov. 4, 1946.

STELGER, JOHN ALBERT, Jun., Comdr. (CEC), U.S. Navy, Box 20, Naval Air Station, San Juan, Puerto Rico, Navy 116, Care, Fleet Post Office, New York, N.Y., reinstated Oct. 18, 1946. To remain on inactive list.

STEMWELL, WILLIAM IGNATIUS, M., Administrative Asst. to Chf. Design Engr., Tennessee Valley Authority, Room 303, Union Bldg., Knoxville, Tenn., readmitted Aug. 12, 1946.

TALBOT, FRANK DEWITT, Assoc. M., 3808 North East 24th Ave., Portland 12, Ore., reinstated Nov. 4, 1946.

TAYLOR, EUGENE LAMAR, Jun., 358 Parish Road, Maplewood, La., reinstated Nov. 4, 1946.

VAN TREES, JOHN ELLIS, JR., Engr., 250 South Waldran Blvd., Memphis 4, Tenn., Assoc. M., reinstated Nov. 7, 1946.

WAGGONER, SAM W., III, Jun., with U.S.N.R., Carthage, Miss., reinstated Oct. 22, 1946.

WHITE, JOHN JOSEPH, M., Specification Writer, Parsons, Brinckerhoff, Hogan & Macdonald, 142 Maiden Lane (Res., 140 Oakland Ave., Tuckahoe 7), N.Y., readmitted Oct. 21, 1946.

WILLIAMS, RICHARD GILES, M., Chf. Engr., Dayton Dist., Lewis C. Bowers & Sons, Inc., 1710 Wayne Ave., Dayton, Ohio, reinstated Oct. 11, 1946.

ZEHNER, JOHN RANDALL, Assoc. M., Purchasing Agt., Turner Constr. Co., 420 Lexington Ave. (Res., 198 North Broadway, Nyack), N.Y., readmitted Aug. 12, 1946.

RESIGNATIONS

BELKNAP, EDWARD MANSFIELD, Jun., 1st Lt., Corps of Engrs., U.S. Army, 866 Newport Drive, Pittsburgh 16, Pa., resigned Oct. 11, 1946.

WITTE, EDWARD GEORGE, Jun., 306 Colonial Rd., Knoxville, Tenn., resigned Oct. 22, 1946.

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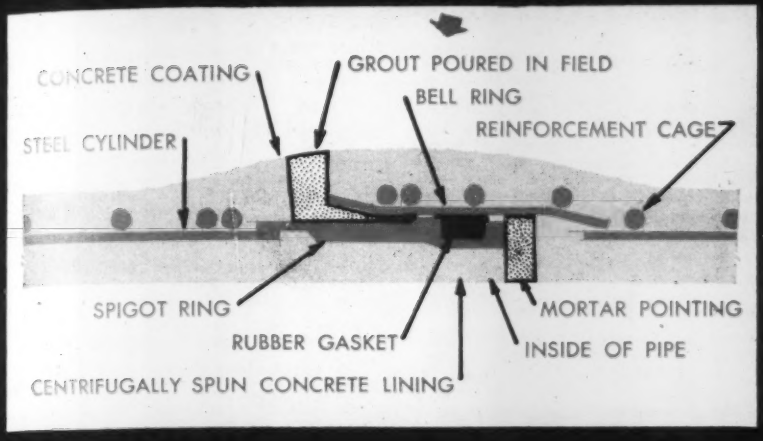

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Applications for Admission or Transfer

DECEMBER 1, 1946 NUMBER 12

The Constitution provides that the Board of Direction shall elect or reject all applicants for admission or for transfer. In order to determine justly the eligibility of each candidate, the Board must depend largely upon the membership for information.

Every Member is urged, therefore, to scan carefully the list of candidates published each month in CIVIL ENGINEERING *and to furnish the Board with data which may aid it in determining the eligibility of any applicant.*

It is especially urged that a definite recommendation as to the proper grading be given in each case, inasmuch as the grading must be based upon the opinions of those who know the applicant personally as well as upon the nature and extent of his professional experience. Any facts derogatory to the personal character or professional reputation of an applicant should be promptly communicated to the Board. Communications relating to applicants are considered strictly confidential.

The Board of Direction will not consider the applications herein contained from residents of North America until the expiration of 30 days, and from non-residents of North America until the expiration of 90 days from the date of this list.

MINIMUM REQUIREMENTS FOR ADMISSION

GRADE	GENERAL REQUIREMENT	AGE	LENGTH OF ACTIVE PRACTICE	RESPONSIBLE CHARGE OF WORK
Member	Qualified to design as well as to direct important work	35 years	12 years	5 years
Associate Member	Qualified to direct work	27 years	8 years	1 year
Junior	Qualified for subprofessional work	20 years	4 years	
Affiliate	Qualified by scientific acquirements or practical experience to cooperate with engineers	35 years	12 years	5 years

APPLYING FOR MEMBER

ALLISON, WALLACE MARMADUKE (Age 50) Dist. Engr., Baltimore Dist., U.S. Engr. Dept., Baltimore, Md.

ALTIERE, JOHN RICHARD (Age 52) Private Practice, Silver Spring, Md.

ANDERSON, WENDELL DRUMMOND (Assoc. M.), Chf. Engr., Mfrs. Promotional Serv., Atlanta, Ga.

ANGWIN, HENRY RAYMOND (Assoc. M.) (Age 57) Bridge Engr., Public Roads Administration, Western Headquarters, San Francisco, Calif.

BAILEY, JOE KASEY (Age 44) Topographic Engr., P-3, U.S. Geological Survey, Chattanooga, Tenn.

BARTON, GEORGE WILLIAM (Assoc. M.) (Age 40) Engr. Director, Associated Consultants, Evanston, Ill.

BATEMAN, WILLIAM HERBERT (Age 54) Asst. Civ. Engr.-in-Chief, Admiralty, Westminster, London.

BELLINGER, HARRY O'BANNON (Age 46) Asst. City Engr., Columbia, S.C.

BROWN, GUY (Age 59) Chf. Engr., Div. of Sewers & Paving, Dept. of Pres., Board of Public Service, St. Louis, Mo.

CROCKER, FORREST SAMUEL (Assoc. M.) Member of firm, Crocker & Ryan, Cons. Engrs., Denver, Colo.

CRUGER-HANSEN, Paul Valdemar (Assoc. M.) (Age 50) Cons. Engr. & Archt., Copenhagen, Denmark.

DELEVA, MARIO MARCELLO (Age 38) Cons. Engr., Torino, Italy.

GILL, MELVILLE KINSELL (Age 39) Scarsdale, N.Y.; Chf. Provincial Engr., Kysinggi, Korea.

GILMAN, GEORGE THOMAS (Assoc. M.) (Age 44) with Moran, Proctor, Freeman & Mueser, N.Y.C.

GRAYSON, LAUREN WILLIAM (Age 39) Supt., Light and Water Depts., Dept. of Public Utilities, Riverside, Calif.

HARRIS, ROY MONTE (Assoc. M.) (Age 45) Chf. San. Engr., Standard Oil Co. of N.J., in Caracas, Venezuela.

HEARD, WILLIAM JACKSON (Age 45), City Mgr., Carey, Ohio.

HEINTSKILL, PETER NICOLAS (Jun.) (Age 35) Recently Lt. Comdr., U.S. Navy, Milwaukee, Wis.

HSUEH-HAI LEE (Age 52) Bridge Engr., London, England.

HUNDER, MARCUS BENJAMIN (Age 45) Chf. Draftsman, P. W. Dept., Charleston Naval Base, North Charleston, S.C.

HUNTER, SAMUEL MARVIN (Age 51) with J. E. Sirrine & Co., Greenville, S.C.

JERNBERG, FRED JOHN (Age 48) Structural Engr., Duquesne Light Co., Pittsburgh, Pa.

LEONARD, EDWIN RAY (Age 45) Structural Engr. and Associate with Fred Elswick, Archt. and Engr., Louisville, Ky.

MCALISTER, FRANCIS MARION (Age 41) with U.S. Marine Corps., San Francisco, Calif.

MCNATT, EDMOND ALSTON (Assoc. M.) (Age 37) Highway Engr., P-5, PRA, Washington, D.C.

MARSTON, ANSON DAY (Age 41) Instructor, Command & Staff Coll., Fort Leavenworth, Kans.

MARX, GEORGE WASHINGTON (Assoc. M.) (Age 45) Director, Div. of San. Eng., Arizona State Dept. of Health, Phoenix, Ariz.

MORK, LEE DALLAS (Assoc. M.) (Age 42) Director of Construction, Supply and Real Estate Service, Veterans' Adm. Branch Office No. 9, St. Louis.

MORTENSON, ERNEST DAWSON (Age 51) Short Beach, Conn.; Structural Engr., Westcott & Mapes, Cons. Engrs., New Haven, Conn.

NELSON, JOHN EARL (Age 62) City Bldg. Inspector, Minneapolis, Minn.

NILES, RENO AUSTIN (Age 42) Supt., with Standard Oil Co. of Indiana, Evanston, Ill.

NORMAN, HENRY ROBERT (Age 42) Head of Civ. Eng., U.S. Engr. Dist. Office, Galveston, Tex.

PETERSON, HAROLD ROBERT (Age 50) Prin. Asst. Engr., Northern Pacific Ry., St. Paul, Minn.

PETTAY, GEORGE THEODORE (Age 46) Major, Corps of Engrs., U.S. Army, Portland, Ore.

PORTEUS, JOHN HORTON (Assoc. M.) (Age 38) Wellesley Hills, Mass.; Structural Engr., with Jackson & Moreland, Cons. Engrs., Boston, Mass.

POTTER, SEYMOUR AUSTIN, JR. (Assoc. M.) (Age 38) Col., Corps of Engrs., U.S. Army, Fort Lewis, Wash.

RAFFERTY, GLENN ANDERSON (Age 41) Lt.-Col., Corps of Engrs., U.S. Army, Post Engr., Decatur Signal Depot, Decatur, Ill.

SCHULZE, FRANZ (Age 63) Cons. and Designing Engr., Industrial Designing Engrs., Chicago.

SMYSER, RUDOLPH ETHELBERT, JR. (Age 40) U.S. Dist. Engr., St. Louis Engr. Dist., St. Louis, Mo.

WARD, ELMER MERVIN (Age 45) Engr. of Maintenance and Equipment, Highway Research Board, National Research Council, Washington, D.C.

APPLYING FOR ASSOCIATE MEMBER

ANDERSON, EDWARD WALTER (Jun.) (Age 31) Jun. Designer and Estimator, American Bridge Co., New York City.

ARNOLD, ALTON DAVIS (Age 31) Lt.-Col., U.S. Army, Liaison Officer, Manhattan Engr. Dist., Oak Ridge, Tenn.

ATKINSON, ROBERT MOUNT (Age 32) Member of firm, E. S. & Robert M. Atkinson, Civ. Engrs. & Land Surveyors, Houston, Tex.

BACLINI, DAVID (Jun.) (Age 33) Structural-Mech. Engr., Anthony M. Meyerstein, Inc., Brooklyn, N.Y.

BEVE, CARL ERIC (Jun.) (Age 34) Estimator and Engr., The Whiting-Turner Contr. Co., Baltimore, Md.

BINGHAM, WILLIAM HORACE (Age 39) Associate Engr., CAA, U.S. Engrs., Fort Worth, Tex.

BOLAND, JOHN VINCENT, JR. (Age 31) Contr., St. Louis, Mo.

BRANDOW, GEORGE EVERETT (Jun.) (Age 33) Private Practice as George E. Brandow & Roy G. Johnston, Structural Engrs., Los Angeles, Calif.

CAPS, JAMES WILLIAM (Jun.) (Age 35) Poteau, Okla.; Engr. (Civ.) P-2, U.S. Engrs., Wister Dam, Okla.

CHERRY, BAYRON EMILE (Age 46) Unit Chf. or Civ. Engr. III, TVA, Decatur, Ala.

COLEMAN, PAUL HENDERSON (Jun.) (Age 29) Jun. Res. Engr., Texas Highway Dept., Cooper, Tex.

CUNNINGHAM, JOHN MONTGOMERY (Age 28) Civ. Engr., Huron-Clinton Metropolitan Authority, Detroit, Mich.

DAVENPORT, GEORGE FOLLIN, JR. (Jun.) (Age 36) in Civ. Eng. Dept., Sun Oil Co., Beaumont, Tex.

FRANK, HOWARD GREENLEAF (Jun.) (Age 35) Civ. Engr., P-3, Office, Chf. of Engrs., U.S. War Dept., Dover, Del.

GRAHAM, DAVID RALEIGH (Age 35) Cons. Structural Engr., Tulsa, Okla.

GREEN, GILES GEORGE (Jun.) (Age 30) Jamaica, N.Y.; with Hardesty & Hanover, Cons. Engrs., New York City.

GROVES, GEORGE ROBERT, JR. (Jun.) (Age 35) Dallas, Tex.; Masonry Contr., Grand Prairie, Tex.

HALL, CHARLES LORING, JR. (Jun.) (Age 27) Res. Engr., American Can Co., Tampa, Fla.

HINTON, HOWARD MAYFIELD (Jun.) (Age 34) Civ. Engr., Designing, Robert & Co., Inc., Atlanta, Ga.

HURLBUTT, ROBERT HAMILTON (Jun.) (Age 36) Davenport, Iowa; Engr. Chf. of Design Branch, U.S. Engr. Office, Rock Island, Ill.

KAFF, JOHN WORLEY (Jun.) (Age 32) Monroe City, Tex.; Civ. Engr., Humble Oil & Refining Co., Houston, Tex.

KAVANAGH, THOMAS CHRISTIAN (Age 30) Yonkers, N.Y.; Instructor in Civ. Eng., N.Y.U.

KOCH, ALVA ERNST (Jun.) (Age 28) Graduate Asst. Instructor and Graduate Student, Civ. Eng. Dept., Texas Agricultural & Mechanical Coll., College Station, Tex.

KUMM, ARTHUR WILLIAM FREDERICK, JR. (Jun.) (Age 29) Plant Engr., The Vilter Mfg. Co., Milwaukee, Wis.

KURTTILA, GEORGE HENRY (Age 41) Bothell, Wash.; Senior Engr., U.S. Engr. Office, Seattle, Wash.

LEMKE, ARTHUR ATHNIEL (Jun.) (Age 33) Mgr., Application Eng., Sewage Eng. Dept., Chicago Pump Co., Chicago, Ill.

LOH, MEI-HUNG (Age 27) with Jackson & Moreland, Boston, Mass.

LOTH, MORITZ AUGUSTUS RUST (Age 52) Highway Engr., Public Roads Adm., Roanoke, Va.

MCELVA, OLIVER RACINE (Age 39) Cons. Engr., Dallas, Tex.

MCKEE, JACK EDWARD (Jun.) (Age 32) San. Engr., Affiliated with Thomas R. Camp, Cons. Engr., Boston, Mass.

MAGILL, EDWARD STAIRS (Age 38) Asst. Prof. of Civ. Eng., Univ. of Manitoba, Winnipeg, Canada.

MASON, JOHN AQUILIN, JR. (Jun.) (Age 34) Private Practice, Charleston, W.Va.

MERRIMAN, WAYLAND (Jun.) (Age 30) Design Engr., with H. N. Roberts, Lubbock, Tex.

MIGUEL, MAURO TOLENTINO (Age 40) Asst. Engr., California-Tex. Oil Co., New York City.

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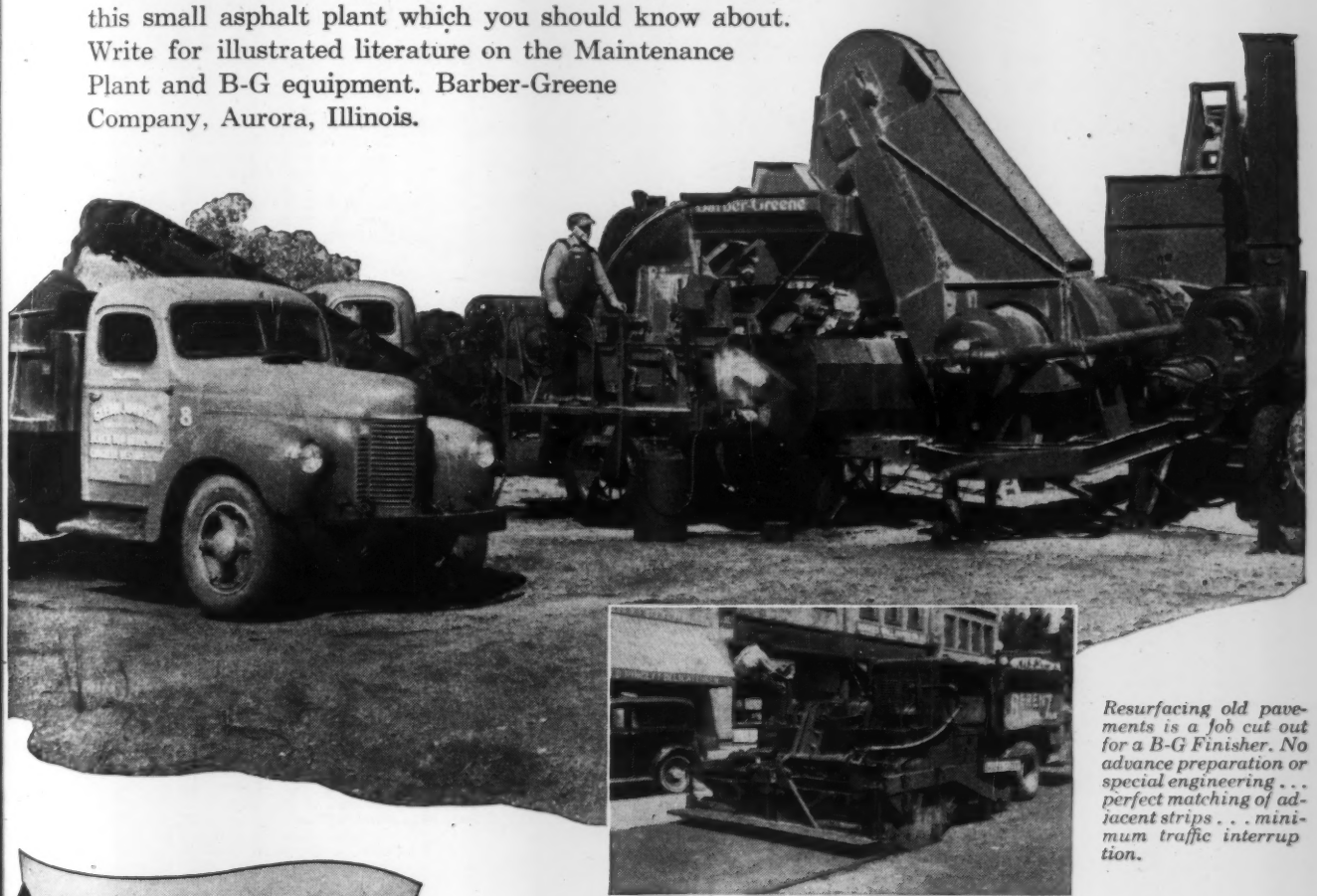

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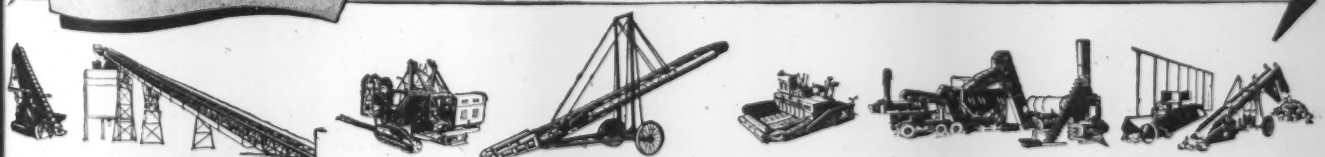

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MOLLOY, JOHN JOSEPH (Jun.) (Age 31) Associate Hydr. Engr., Water Resources Branch, U.S. Geological Survey, Ithaca, N.Y.

ONDRA, OTAKAR GORDON (Jun.) (Age 32) Asst. Prof. of Civ. Eng., Manhattan Coll., N.Y.C.

PAYNE, CHARLES WARREN, JR. (Age 58); La Grange, Ill. Dist. Mgr. and Vice-Pres., The Austin Co., Chicago, Ill.

PEARSON, HAROLD MILLER (Age 38) Engr., P-4, U.S. Bureau of Reclamation, Tracy, Calif.

PETERSON, JAMES MARSLOWE (Jun.) (Age 32) San Diego, Calif.; Asst. Bridge Engr., Calif. State Div. of Highways, Bridge Dept., Sacramento.

PORTER, HARRIS CARLEY (Age 42) Engr. Aide IV, Los Angeles County Flood Control Dist., Pasadena, Calif.

POWELL, WALDO STANISLAUS (Jun.) (Age 33) Yonge & Hart, Archts., Pensacola, Fla.

PULLY, ROBERT VINSON (Jun.) (Age 35) Engr., P-4, Corps of Engrs., Hq. 8th Service Command Engr. Office, Dallas, Tex.

SELLNER, EDWARD (Jun.) (Age 34) Asst. Prof., Civ. Eng. Dept., Kansas Univ.; Associate Engr., Div. of Sanitation, Kansas Board of Health, Lawrence, Kans.

SHELTON, EDGAR GREER (Age 53) Chf. Draftsman and Structural Designer, McLellan Stores Co., New York City.

SIMPSON, CHARLES COURTNEY (Age 31) Civ. Engr., Bureau of Reclamation, Denver, Colo.

SLOANE, RICHARD LEWIS (Jun.) (Age 28) Associate Prof. of Civ. Eng., Univ. of Utah, Salt Lake City, Utah.

STEARNS, RAYMOND GUY (Jun.) (Age 34) Associate Engr., War Dept., U.S. Engr. Office, Rock Island, Ill.

STEGMAN, CLAUDIO FEDERICO (Age 37) with Highway Dept., Province of Mendoza, Buenos Aires, Argentina.

THOMPSON, MORGAN HOUGHTON, JR. (Jun.) (Age 33) Engr., P3-C, Special Eng. Div., The Panama Canal, Diablo Heights, C.Z.

TIGRAK, MEHMET FUAT (Jun.) (Age 35) Designing Engr., Posta Kutusu, Turkey.

VARTIA, KARL OLAVI (Age 34) Engr., P-3, Civ., Balmorhea Project, U.S. Bureau of Reclamation, Balmorhea, Tex.

WAGER-SMITH, David R. W. (Age 46); Albuquerque, N.Mex.; Private Practice, Silver City, N.Mex.

WILDE, STAFFORD HAROLD (Age 38) Cons. Engr., W. S. Bellows Constr. Co., Houston, Tex.

WONG, RALPH F. (Age 37) Associate Engr., U.S. Engr. Office,, Los Angeles, Calif.

APPLYING FOR JUNIOR

BIDDISON, CYDNOR MARK, JR. (Age 28) Structural Designer, with John Case, Structural Engr., Alhambra, Calif.

CROWLEY, JOHN ARTHUR (Age 32) with Air Force, U.S. Army, Waterbury, Conn.

JONES, GLYNDWR MALCOLM (Age 23) Engrs. Asst., State Hydro-Elec. Dept., North Otago, N.Z.

LECRAW, CHARLES STOCKARD, JR. (28) Traffic Engr., Eno Foundation, Saugatuck, Conn.

NOVACK, JOSEPH EPHRAIM (Age 26) Jun. Eng., Horner & Shifrin, St. Louis, Mo.

REED, CARROLL SHERMAN (Age 29) recently released from Navy, Canton, Ohio.

SHIRK, CHARLES ALBERT (Age 26) Structural Designer, Hazelot & Erdal, Cons. Engr., Gary, Ind.

VAN GELDER, THEODORE (Age 27) Operation Sgt., U.S. Army, Chicago, Ill.

ALA. POL. INST.

	AGE
JOHNSON, RUFUS CLIFTON, 1944	(23)
COBB, EDWIN ALLEN, 1946	(24)

UNIV. OF. ALA.

BREITLING, THOMAS OTTO, 1944	(23)

BROWN UNIV.

GETTER, GUVTAV, 1946	(20)

CARNEGIE INST. TECH.

MILLER, EDWARD HENRY, 1942	(28)

THE CITADEL

CREED, THOMAS FOSTER, JR., 1946	(26)

CLARKSON COLL. TECH.

RONAN, NEWTON FRANCIS, JR., 1946	(23)

UNIV. OF CONN

PELLETIER, CHARLES JAMES, 1944	(23)

DARTMOUTH COLL.

AMY, LYDON EIDLITZ, 1942	(25)
JOHNSON, J. HAROLD, 1946	(20)

UNIV. OF ILL.

CAIN, GERALD IRWIN, 1946	(23)
CRUMRINE, HAROLD EUGENE, 1946	(22)
POLK, ROBERT LEWIS, 1946	(27)
RASTEDE, JOHN WILLIAM, 1946	(24)
SCHINDLER, RICHARD RUDOLF, 1946	(24)
THALMAN, WILLIAM EUGENE, 1946	(23)
WILKIE, JOHN ROBERT, 1946	(26)

IOWA STATE COLL.

DISERENS, ROBERT LOUIS, 1946	(26)

KANS. STATE COLL.

WILSON, JAMES ALLEN, 1944	(24)
TALLEY, GLENN WESLEY, 1946	(29)

UNIV. OF KANS.

SMOOTS, VERNON ALLEN, 1944	(24)
STACEY, WILLIAM ARTHUR, III, 1944	(24)
EBERHARDT, FRANK CHRISTOPHER, 1946	(26)
DOUGLAS, WILLIAM HARRISON, JR., 1946	(21)
HAMILTON, ROLLAND MORRIS, 1946	(21)

MANHATTAN COLL.

CAMPBELL, GEORGE ARMSTRONG, JR., 1946	(22)
FLOOD, JOHN THOMAS, 1946	(22)
SHERIDAN, FRANCIS DENIS, 1946	(23)

UNIV. OF MD.

DOWNS, HUGH GIFFORD, 1941	(27)

UNIV. OF MICH.

WEISBERG, IRVING MARTIN, 1946	(20)

UNIV. OF MO.

ISEMOTO, ARTHUR TOSHIHISA, 1946	(24)
NORWOOD, JOHN EVERETT, 1946	(26)

COLL. OF CITY OF N.Y.

MENDLOWITZ, SAMUEL, 1944	(22)
FRANK, ABBOTT, 1945	(20)
DELL'ABATE, RALPH, 1946	(20)
NEWMAN, ALLAN M., 1946	(22)
SCHWARTZ, MILTON, 1946	(20)

NORTHWESTERN UNIV.

LINDENBERGER, JAMES NEWTON, 1946	(21)
MERRIMAN, JOE JACK, 1946	(20)

UNIV. OF OKLA.

HILL, WILLIAM BYRON, 1946	(25)

ORE. STATE COLL.

LAUSMANN, JOSEPH HERMAN, JR., 1946	(27)

PA. STATE COLL.

FISKE, GORDON LYMAN, 1943	(23)

UNIV. OF PA.

SHORE, SIDNEY, 1943	(25)

PRINCETON UNIV.

LEVIEN ROBERT ERNST, 1944 Recently with USNR	(23)

RENS. POL. INST.

OJALVO, MORRIS, 1944	(22)

UNIV. OF SO. CALIF.

MANNING, TRAVIS LIONEL, 1946	(26)
PICK, JAN, 1946	(22)

UNIV. OF S.C.

HALTINWANGER, JOHN DAVID, 1945	(21)

SO. METHODIST UNIV.

LYTLE, ANDREW BENJAMIN, 1946	(28)
OWENS, THOMAS H., JR., 1946	(21)
BEEBE, GEORGE CLIFTON, 1946	(21)
DILLENBECK, JOSEPH BROWN, 1946	(21)

TEX. A. & M. COLL.

BARKER, ELI FRED., 1946	(20)
FRANKLIN, CYLDE CLAYTON, 1946	(24)
LACY, JAMES DAVID, 1946	(25)

VA. MIL. INST.

EWELL, JOHN FRANCIS, 1946	(20)

VA. POL. INST.

FARTHING, WILLIAM GARDINER, 1946	(25)
MARTINEZ, OLIMPIO RAMON, 1946	(20)

VILLANOVA COLL.

COLLEGEMAN, LEROY HERMAN, 1945	(21)
COYNE, JOHN WILLIAM, 1946	(21)

UNIV. OF WIS.

FROEMMING, GALE ARTHUR, 1946	(25)

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AMERICAN RAILWAY ENGINEERING ASSOCIATION. Proceedings of the Forty-Fifth Annual Convention, Vol. 47. Published by the American Railway Engineering Association, Chicago (59 East Van Buren St.), 1946. 786 pp., illus., tables, diagrs., charts, cloth, apply. The proceedings of the forty-fifth annual convention—held in Chicago, March 12–14, 1946—constitute this comprehensive volume. The thirty committee reports include papers on the economics of railway location and operation; highways; water service, fire protection and sanitation; yards and terminals; waterways and harbors; buildings; ties; wood preservation; economics of railway labor; cooperative relations with universities; and many other phases of operation.

BEAMS ON ELASTIC FOUNDATION. By M. Hetényi. The University of Michigan Press, Ann Arbor, Mich.; Geoffrey Cumberlege, Oxford University Press, London, 1946. 255 pp., diagrs., charts, tables, $10^1/_4 \times 6^3/_4$ in., cloth, $4.50. This book deals with the analysis of elastically supported beams. Chiefly theoretical in nature, the book also discusses applications to a variety of technical problems. Beginning with the general solution of the elastic line, the several chapters treat of beams of finite and unlimited length, beams of variable rigidity and modules of foundation, bars under various loadings, the torsion and elastic stability of bars, circular arches, and continuity in the foundation. Although mainly in the field of statics, the solutions developed may also be employed in such fields as vibration and acoustics.

ENGINEERING PRACTICE, a Review of Modern Technique. Vol. 1. By H. Hirst. Engineering Practice, 349 Collins St., Melbourne, C. 1. (349 Collins St.), Australia, 1945. 159 pp., illus., diagrs., tables, $9^3/_4 \times 7^1/_4$ in., fabrikoid, 25s. First of a projected series dealing with the important aspects of present-day engineering technique, this volume covers the following topics: Soldering of aluminium and its alloys; centrifugal casting of ferrous and non-ferrous components; properties and manufacture of bearings and bearing materials; forging of aluminium alloys; die casting. Intended for the Australian engineering industry, these articles review the technical literature and discuss developments of the last five years both in Australia and overseas. The connection between theory and practice is adequately stressed, and bibliographies are provided.

TRANSPORTATION PRINCIPLES AND PROBLEMS. By T. C. Bigham. McGraw-Hill Book Co. New York and London, 1946. 626 pp., diagrs., charts, maps, tables, $9^1/_4 \times 6$ in., cloth, $5. Designed for college courses in transportation, this textbook covers railroads, motor carriers, pipe lines, airways, and inland coastwise and intercoastal waterways. These forms of transportation are treated jointly from a functional point of view, with the primary purpose of promoting the establishment of more rational transportation policies. A historical and factual background is presented in the early chapters, followed by material on state and federal legislation on transportation. Over 200 pages are devoted to the various aspects of the important problem of rate setting. The last seven chapters take up service, security issuance, combination of carriers, labor, public aid, government ownership, and general improvement of public policy. Extensive footnotes and references are provided.

TRIGONOMETRY, 2 ed. By H. K. Hughes and G. T. Miller. John Wiley & Sons, New York; Chapman & Hall, London, 1946. 175 pp., diagrs., charts, tables, $8^3/_4 \times 5^1/_2$ in., cloth, $2.50. Intended for use in a first course in trigonometry for college freshmen, this book aims particularly at clearness and ease of understanding. To this end, certain changes in the order and amount of material have been made in the new edition. More than customary attention is given to the law of cosines and to the use of logarithms with this law. No tables are included in the volume.

VERTICAL CURVES FOR ROADS, a Textbook for Highway Engineers and Students. By F. G. Royal-Dawson. E. & F. N. Spon, Ltd., London, 1946. 141 pp., diagrs., charts, tables, $7^1/_2 \times 5$ in., cloth, 15s. A small British book, treating summit curves and valley curves, contains examples of calculations and their solutions, charts, tables, and formulas. One chapter deals with the effect of wheel impact on road obstacles.

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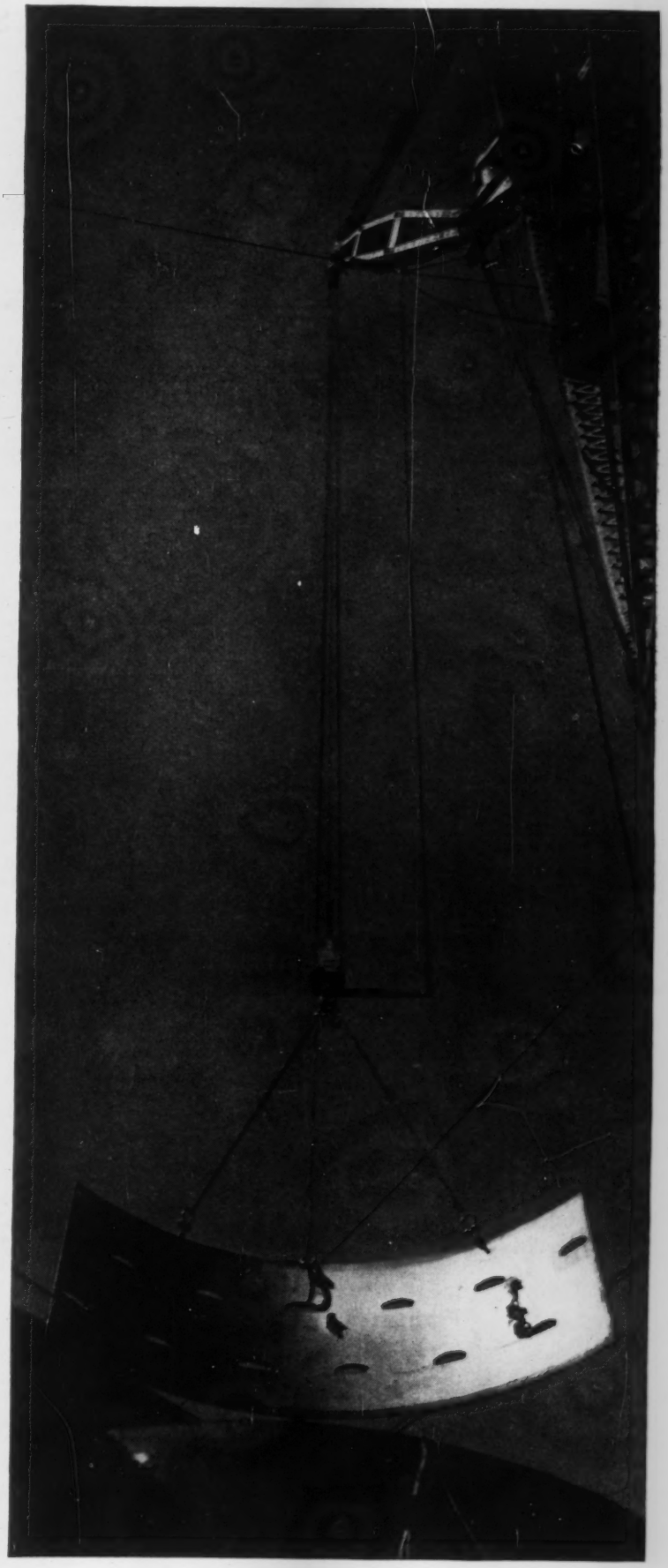

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MEN AVAILABLE

CIVIL AND CITY PLANNING ENGINEER; Jun. ASCE; 35; B.S. in C.E., University of Illinois, 1934; 6 years' experience in office and field hydraulic engineering; 5 years in Corps of Engineers, Lt. Col. (1 year heavy road construction, Alaska Highway); 8 months' city planning engineering. Immediately available. Desires position with city planning consulting firm in Southeastern or Southwestern states. C-326.

CIVIL ENGINEER; Jun. ASCE; age 29; married; 9 years' experience in industry and engineering, including design, inspection, construction, and surveying. Desire permanent position with engineering or contracting firm in or near Detroit. C-327.

CIVIL ENGINEER EXECUTIVE; M. ASCE; 35 years' highway and general engineering experience. Working knowledge of Spanish. Available for executive position in industry or engineering allied with highway work. C-328.

CIVIL ENGINEER; Jun. ASCE; 26; married; B.S. in C.E., Georgia School of Technology, 1942. 4 years' experience in general construction, Army Corps of Engineers; now employed as civil engineer for small construction company. Desire permanent position with good future in Texas. All positions considered. C-329.

CIVIL DESIGN ENGINEER; Assoc. M. ASCE; with 20 years' experience in design of dams, spillways, powerhouses, appurtenant reinforced concrete structures, outlet works, penstocks, tunnels, pipe lines. Work consisted of preliminary and final design, supervision of design, preparation of estimates, administration. Desires permanent position, preferably East or South. Salary dependent upon future of job. C-330.

CIVIL ENGINEER; Assoc. M. ASCE; 37; 13 years' broad experience in hydraulic and civil engineering—testing hydraulic models; collecting and analyzing hydrologic and hydraulic data; preliminary designing and estimating for dams, power plants, floodwalls, levees, and drainage structures; writing letters and technical reports. Desire permanent position in central or western United States. C-331.

ENGINEER EXECUTIVE; Jun. ASCE; 36; wide experience, large projects—consultants, contractors; registered; commander, CEC, USNR; commanding officer, Seabee Battalions; design manager and resident engineer. Excellent references. C-332.

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CONSTRUCTION ENGINEERS with B.S. in civil or mechanical engineering. Minimum of 3 years' experience in the field subsequent to several years office training, preferably on equipment related to petroleum refining and allied chemical industries. Will be responsible for the proper coordination of the field work. Duties include the interpretation of all drawings, specifications, lists, contract terms, etc., the inspection of field construction, and the performance of general liaison work between owner, engineering department, and the contractor. Location, United States and foreign assignments. W-7985.

ENGINEERS. Must report single status. (*b*) Construction Foreman, under 35, civil graduate, with 3 years' experience in field construction work. Salary, $4,200 a year plus living allowance. (*c*) Field Engineer, civil graduate, under 35, with at least 3 years' field experience, to do drafting in connection with designs and details, and act as inspector. Knowledge of Spanish desirable. Salary, $4,200 a year. Location, eastern Venezuela. W-8010.

ASSISTANT OR ASSOCIATE PROFESSORS. (*a*) Specialist in sanitary engineering, young. Should have some record of research and publication, and some practical experience. Salary, $3,000–$4,000 a year. (*b*) Specialist in applied hydraulics, young. Should have some record of research and publication and some practical experience. Salary, $3,000–$4,000 a year. Will consider men with master's degrees without much field experience. (*c*) Instructor, young, for general teaching in the field of civil engineering and applied mechanics, including materials laboratory work, surveying, applied mechanics, strength of materials, structures. Men with some experience and higher degrees will be considered for assistant professorships. Salaries, Instructors, $2,200–$2,700; Assistant Professors, $2,800–$3,400 a year. Location, Texas. W-8046-R3796.

INSTRUCTOR OR ASSISTANT PROFESSOR of civil engineering, preferably with advanced degree, 25–40, to teach surveying, materials testing, and other courses. Ability to develop course in soil mechanics desired. Position starts in January 1947. Location, Vermont. W-8077(*a*).

SALES ENGINEER, 25–30, civil graduate, with highway construction experience, to represent an asphalt producer and call on road contractors, highway officials, etc. Must be resident of Westchester County and own a car. Salary, $3,000 a year plus expenses. Location, New York, N.Y. W-8095.

RESIDENT ENGINEER with airport, sewer, and general building construction experience. Salary $7,000–$8,000 a year. Location, Alaska. W-8142.

CIVIL ENGINEERS to teach courses in materials of engineering, strength of materials, highway and hydraulics. Advanced degree and 2 or more years' experience with consulting firm or equivalent, desirable. Rank and salary open. Positions start in February 1947. Location, New York State. W-8145.

ENGINEERS trained in American methods of engineering. (*a*) Surveyors, six, with at least 5 years' experience. Two should be experienced in triangulation and geodetic surveying, including determination of geographic positions; one, experienced in levelling; and three, experienced in topographic surveys for dam and reservoir sites and irrigation development. (*b*) Engineers with at least 10 years' experience in studies of economic feasibility and preliminary design of irrigation, water power, water supply, and flood control projects. (*c*) Geologist with at least 10 years' experience in engineering geology for dams and reservoirs, underground water supply, and materials for construction. Experience in economic or petroleum geology is also desired. Salaries open. Location, Afghan. W-8151.

ENGINEERING INSTRUCTION. (*a*) Professor of hydraulics, preferably with Ph.D. Salary, $4,000–4,500. (*b*) Associate Professor of surveying, preferably with Ph.D. Salary, $3,600–$4,000. (*c*) Associate Professor of mechanics, preferably with Ph.D. Salary, $3,600–$4,200. (*d*) Associate Professor of transportation, preferably with Ph.D., with experience in soils and construction. Salary, $3,600–$4,000. (*e*) Assistant Professors of mechanics, preferably with M.S. Salary, $3,400–$3,600. (*f*) Assistant Professor of structures, with M.S. and structural experience. Salary, $3,400–$3,800. (*g*) Instructors of mechanics, preferably with M.S. Salary, $2,200–$2,600. (*j*) Instructor of hydraulics, preferably with M.S. Salary $2,200–$2,800. (*k*) Graduate Students—mechanics, hydraulics, or structural, with B.S. Salary, $600–$1,000. Positions on 10-month basis. Location, Oklahoma. R-3783.

CIVIL ENGINEERS to teach courses in materials of engineering, strength of materials, highways, and hydraulics. Advanced degree and 2 or more years' experience with consulting firm or equivalent desirable. Rank and salary open. Positions start in February 1947. Location, New York State. W-8145.

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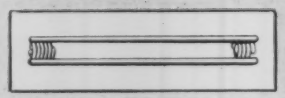
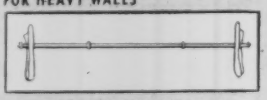
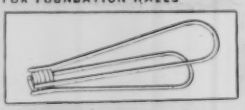


T2—TYSCRU 2 STRUT FOR HEAVY WALLS

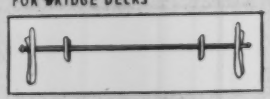


SNAP-TY ASSEMBLY UNIT FOR FOUNDATION WALLS

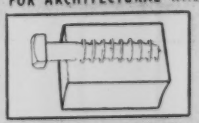


TL4F—TYLOOP FLARED 4 STRUT FOR DAMS

TH—TYHANGER FOR BRIDGE DECKS



AC FORM TY ASSEMBLY UNIT FOR ARCHITECTURAL WALLS



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BRIDGES

CONCRETE ARCH, SWEDEN. Sandoe Bridge, Sweden. *Engineer*, vol. 181, no. 4715, May 24, 1946, p. 475. Brief description of bridge claimed to have longest concrete arch in world; this bridge, opened in 1943, carries highway across Angerman River, and is situated on Stockholm and Haparanda road; total length, 3,200 yd.

CONCRETE GIRDER, TACOMA, WASH. Box Members Distinguish Concrete Bridge. *Eng. News-Rec.*, vol. 136, no. 26, June 27, 1946, pp. 996–997. Illustrated description of concrete box-girder bridge recently built in Tacoma, Wash.; deck consists of 4 box-girder cells; girder thus formed is continuous over 3 spans of 95, 115, and 95 ft, respectively; bent-up longitudinal bars were omitted from narrow-webbed beams; however, adequate strength was provided by vertical stirrups and by main longitudinal bars, placed both top and bottom with no bends.

CONSTRUCTION, MILITARY ENGINEERING. Bailey Bridge, J. A. Thierry. *Military Engr.*, vol. 38, no. 245, Mar. 1946, pp. 96–102. Illustrated review of role of Bailey all-purpose type of bridge during war; discussion covers its development since 1940 and gives design details of panels, floor system, seatings, and panel crib piers; various forms of Bailey bridges are described and their uses in Europe, Africa, and elsewhere enumerated; effect of Bailey design on future military bridging, and factors tending to make it obsolete.

CONCRETE, PRE-STRESSED. Prestressed Concrete Bridges, V. S. Murray. *Roads & Bridges*, vol. 84, no. 6, June 1946, pp. 41–46. Study of methods of overcoming inherent weakness of concrete in tension by pre-stressing, and application to long-span structures; description of Magnel's system, Schorer system, and Bilner electrical method; merits of pre-stressing for piles and poles; stress diagrams and construction details presented.

CONSTRUCTION, MILITARY ENGINEERING. Bridge Reconstruction in Philippines, R. H. Paddock. *Military Engr.*, vol. 38, no. 245, Mar. 1946, pp. 112–115. Operations of Aviation Engineer Battalion in Luzon campaign involved reconstruction of numerous damaged bridges and construction of new ones, including pile and trestle-bent bridges, Bailey and H-20 spans, and concrete and steel bridges; details of work on reinforced concrete bridge south of Manila, 30-ft bridge at Lipa, and steel bridges and low-level timber bridges in Cagayan Valley.

CONSTRUCTION, MILITARY ENGINEERING. Ernie Pyle Bridge, C. W. Neuscheler. *Military Engr.*, vol. 38, no. 246, Apr. 1946, pp. 153–155. Illustrated description of 325-ft Ernie Pyle Bridge over Fulda River, Germany, designed for army loads; frame bents were used throughout instead of single bents due to extreme grade of bridge; also weight of bridge and loads was too great for single bents of required height.

HIGHWAY, CONNECTICUT. Design of Wilbur Cross Parkway Bridges, J. F. Willis. *Eng. News-Rec.*, vol. 136, no. 20, May 16, 1946, pp. 792–797. Illustrated description of grade-elimination bridges for Connecticut's superhighway; Fountain St. Bridge is skewed reinforced concrete arch with wingwalls supported on columns; crossing over Route 69 is carried on two-span welded, continuous girder, and Dixwell Ave. bridge is all-welded 126-ft deck-plate girder span designed for composite action with concrete slab; major considerations affecting design of these and other structures are outlined.

RAILROAD. Rhine Railway Bridges in British Zone. *Ry. Gaz.*, vol. 84, no. 17, Apr. 26, 1946, pp. 460–461. Summary recording various bridges and notes on reconstruction of Baerl Bridge as permanent structure; map showing position of bridges over the Rhine in British Zone, is presented.

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RAILROAD, BURMA. Restoration Work on Burma Railways, *Ry. Gas.*, vol. 84, no. 20, May 17, 1946, pp. 539–542. Progress made by Indian Military Railway Engrs. in Burma Theater of Operations in restoring bombed bridges of Burma Railways; sketch map showing position of all demolished big bridges in southern Burma, and sketch of Pegu-Sittang section of Martaban line, showing positions of destroyed bridges, presented.

RAILROAD, MAINTENANCE AND REPAIR. Carlisle-Kingsmoor Widening on L. M. S. Railway. *Engineering*, vol. 161, no. 4196, June 14, 1946, pp. 555–557. Work undertaken, in addition to provision of new river bridge, included widening embankment and duplication of dry bridge, widening cutting north of river with retaining walls, and underpinning road bridge abutment; bridge was constructed on curve of 42 chains radius; superstructure consists of pre-cast reinforced concrete T-beams.

STEEL, QUEBEC. Welded Girder Bridge Is 1,500 ft. Long, D. B. Armstrong. *Eng. News-Rec.*, vol. 136, no. 18, May 2, 1946, pp. 698–701. Illustrated description of 1,500-ft St. Rose bridge north of Montreal, Canada, which is believed to be longest welded continuous girder bridge; expansion joints used at ends of bridge only, and concrete deck serves as lateral bracing; special welding procedure used at field joints to avoid buckling from locked-up stresses.

SUSPENSION, GERMANY. Multiple-Span Suspension Bridge to Replace Rhine Arches at Duesseldorf, D. B. Steinman. *Eng. News-Rec.*, vol. 136, no. 26, June 27, 1946, pp. 982–985. Two wrecked 595-ft steel arches over the Rhine at Duesseldorf, Germany, are to be replaced by suspension bridge with four 312-ft spans; horizontal tie cables are used between tower tops; main cables are of locked coil type, while parallel wire construction is used for tie cables; adopted design permits widening of roadway.

VIADUCTS, MAINTENANCE AND REPAIR. Welding Repairs on 4,000-ft. Viaduct, J. M. Heffelfinger. *Eng. News-Rec.*, vol. 136, no. 24, June 13, 1946, pp. 912–913. Recent repair of Clark Avenue viaduct across Cuyahoga Valley at Cleveland, Ohio, involved replacement and reinforcing of trusses, railing, and brackets for sidewalk support, rebuilding of expansion joints, and strengthening of weakened towers, girders, and stringers; all these repairs were accomplished by welding.

BUILDINGS

EARTHQUAKE RESISTANCE. Three-Story Building on Roller Bearings. *Eng. News-Rec.*, vol. 136, no. 24, June 13, 1946, pp. 925–927. To conform to California's laws on earthquake-resistant construction it was necessary to provide for horizontal forces in three-story addition placed on top of Los Angeles building not designed for earthquake forces; addition was anchored with horizontal ties to adjacent building designed to resist horizontal forces, while roller bearings transmit only vertical loads to old building below.

INDUSTRIAL PLANTS, DESIGN. "Controlled-Conditions" Buildings Compared with Conventional Factories. *Eng. News-Rec.*, vol. 136, no. 20, May 16, 1946, pp. 784–787. Illustrated description of new type of industrial building with virtually no windows and with mechanical control of temperature and humidity; method of obtaining good light; noise reduction; statistical data reveal construction costs to be about 18% higher than those of conventional buildings, but savings through increased production, improved quality of products, and better labor relations may offset these extra construction costs.

PILE. 42,000 Piles Driven on Project. *Arch. Rev.*, vol. 100, no. 2, Aug. 1946, p. 121. Illustrated report on new type of pile which has been employed for foundation of Metropolitan Life 75-acre housing project in New York; pile is characterized by "button bottom" point of pre-cast concrete which proved most effective for rock-fill area.

SOVIET UNION. Soviet Union Develops New Building Techniques. *Eng. News-Rec.*, vol. 136, no. 20, May 16, 1946, pp. 798–802. Illustrated report on techniques, applied by Soviet Union to huge building construction plan; new theory for designing reinforced concrete, winter concreting methods and earthquake-resistant brick arch roof have been developed; pre-fabrication and standard designs are used to large extent. Bibliography.

CITY AND REGIONAL PLANNING

ALGERIA. Town Planning in Algeria. *Roy. Inst. Brit. Architects—J.*, vol. 53, no. 8, June 1946, pp. 349–351, (discussion) 351–352. Discussion of conditions that influence city planning, such as concentration of factories into zones of 200 to 400 ha in vicinity of ports in low, unproductive land, separation of factories and residential areas by deep green belts, several hundred meters wide, selection of open hillsides for establishment of residential localities of about 40,000 inhabitants; this plan has been adopted by Algiers, Oran, and Bone.

GREAT BRITAIN. Influences Affecting Planning in Scottish Counties with Special Reference to Small Burghs and Towns, J. S. McGavin. *Surveyor*, vol. 105, no. 2840, June 28, 1946, pp. 499–500. Article deals with principles of planning for small communities, need for long-term plan, rural amenities, redistribution of industry, rural population problems, grouping of villages and fair-sized nuclear town, and other problems. Before Instn. Mun. and County Engrs.

GREAT BRITAIN. Proposed New Town at Stevenage. *Engineer*, vol. 181, no. 4713, May 10, 1946, p. 436. In Greater London Plan, ten sites were indicated as suitable for new towns, from which it was suggested that required eight sites might be selected; one of these was Stevenage; development of new town would proceed by stages, commencing in 1947 and reaching peak of development activity in 1951; aim would be to make full provision for population of 45,000 in about ten years.

CONCRETE

DRYDOCKS. Drydock Construction at Cape Town, C. M. J. Kohler. *Eng. News-Rec.*, vol. 136, no. 22, May 30, 1946, pp. 859–862. Illustrated description of construction of world's largest drydock at Cape Town, South Africa; concrete was placed into traveling steel forms in successive monolith by large cranes handling 2-cu yd buckets; grouting was used to seal concrete walls against leakage; closure gate slides into adjacent recess while auxilliary floating caisson may be used as emergency gate or to subdivide dock.

HANGARS. Cantilevered Concrete Trusses Provide Open Working Areas in Hangar, A. J. Boase. *Eng. News-Rec.*, vol. 136, no. 22, May 30, 1946, pp. 850–855. Major structural feature of hangar at Santos Dumont Airport in Rio de Janeiro, Brazil, is cantilevering of concrete roof trusses on either side of central rigid frames; details of structure and construction are described.

STAIRS. Concrete Spiral Stairway Connects Parkway Bridges. *Eng. News-Rec.*, vol. 136, no. 22, May 30, 1946, p. 845. Illustrated description of reinforced concrete spiral stairway connecting two parkway bridges that carry Figueroa St. over Los Angeles River at beginning of Arroyo Seco Parkway; essentially, design consists of hollow reinforced concrete cylinder that supports spiral stairway by use of keys and bars.

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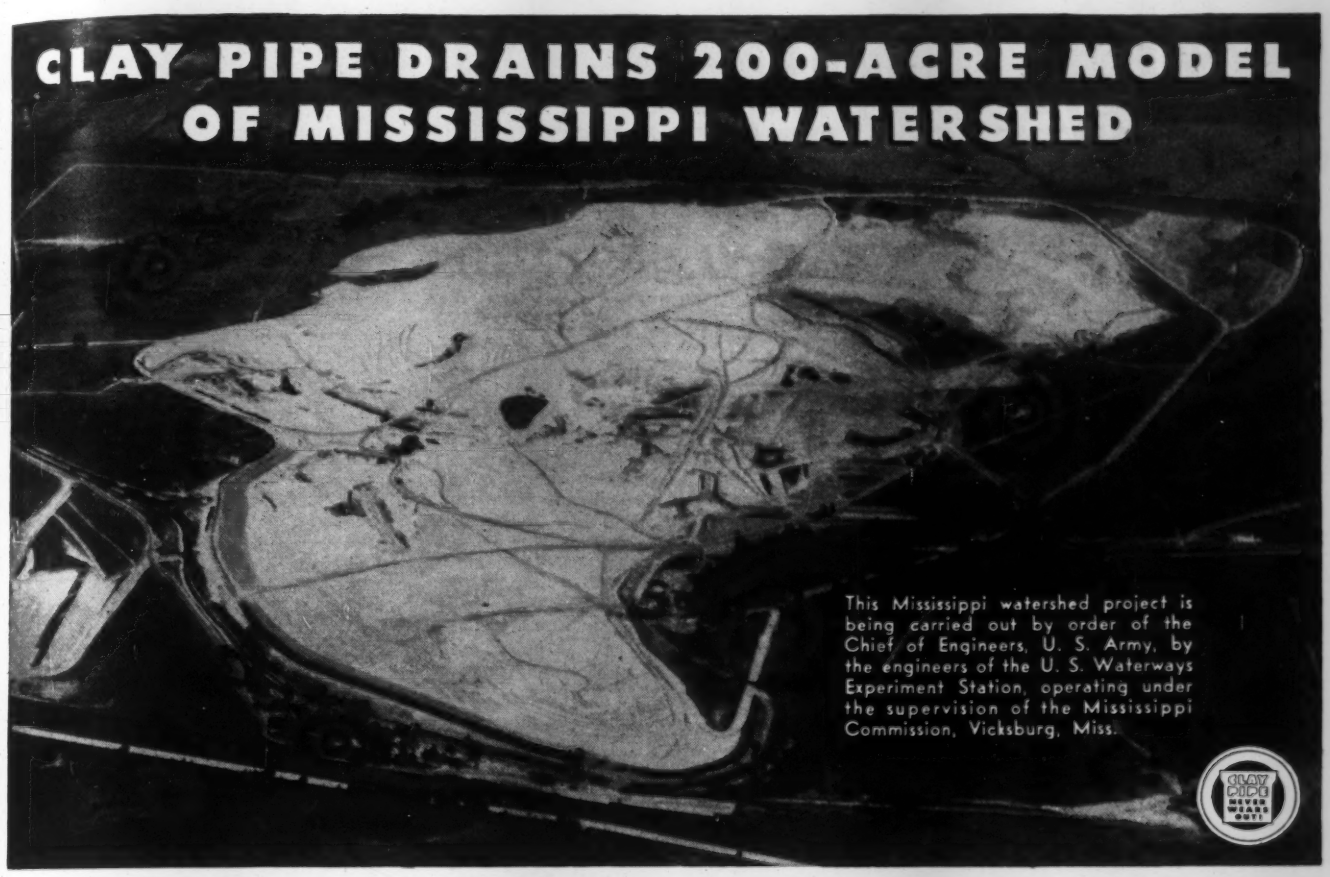

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STEEL, QUEBEC. Welded Girder Bridge Is 1,500 ft. Long, D. B. Armstrong. *Eng. News-Rec.*, vol. 136, no. 18, May 2, 1946, pp. 698–701.

ing Repairs on 4,000-ft. Viaduct, J. M. Heffelfinger. *Eng. News-Rec.*, vol. 136, no. 24, June 13, 1946, pp. 912–913. Recent repair of Clark Avenue viaduct across Cuyahoga Valley at Cleve-

Los Angeles River at beginning of [illegible] Parkway; essentially, design consists of hollow reinforced concrete cylinder that supports spiral stairway by use of keys and bars.

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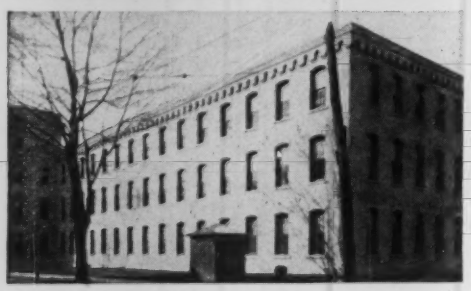

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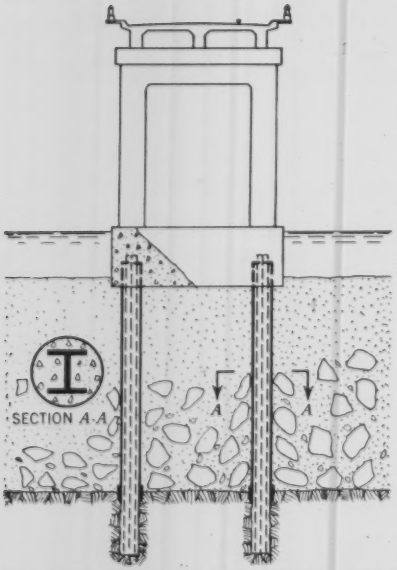

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WALLS. High Concrete Walls Partition Building Into Curing Chambers for Linoleum. *Eng. News-Rec.*, vol. 136, no. 26, June 27, 1946, pp. 978–980. Illustrated description of "stove" building, consisting of series of huge, reinforced concrete walls, 16 in. thick, 59 ft high, and 177 ft long; they form ovens used for curing of linoleum; during construction, temporary ties were used to support free-standing walls.

DAMS

EARTH, PROTECTION. Deep Cutoff Trench of Puddled Clay for Earth Dam and Levee Protection, H. Kramer. *Eng. News-Rec.*, vol. 136, no. 26, June 27, 1946, pp. 986–990. Illustrated description of new method of preventing both through-seepage and under-seepage in earth levees and dams by sealing deep cutoff trench with clay slurry and backfilling it with puddled clay; full-scale field test by U.S. Army engineers demonstrated effectiveness of new method.

FLOOD CONTROL

MISSOURI RIVER. Missouri River Development Program, L. A. Pick. *Am. Water Works Assn.—J.*, vol. 38, no. 7, July 1946 pp. 859–867. Report on Flood Control Act, 1944, authorizing plan for Missouri basin, including water for consumption; discussion of Missouri River water supply, survey of flood and drought problems, conditions at Kansas City, Omaha, Council Bluffs, and St. Louis, survey of sanitation requirements, and progress on flood and drought-control plan.

FLOW OF FLUIDS

MEASUREMENT. Universal Chart Gives Speedy Answers to Problems in Fluid Flow, W. C. Woodman. *Power*, vol. 90, no. 5, May 1946, pp. 297–299. Nomograph-type charts enable rapid solution of problems concerning fluid flow in closed conduits or pipes, taking proper account of variation in friction factor as function of Reynolds number and conduit wall relative roughness; data facilitate selection of size commensurate with fluid pressure loss; summary of fluid flow theory.

FOUNDATIONS

BEARING CAPACITIES. Calculation of Bearing Capacities of Footings by Circular Arcs, P. Andersen. *Eng. News-Rec.*, vol. 136, no. 22, May 30, 1946, pp. 866–868. Discussion of Krey's method of determining bearing capacity assuming surface of rupture consisting of cylindrical surface and tangent plane; simplified method uses two arcs; application of theory to practical example, and comparison of Rankine method, circular arc method, and Krey method; design diagrams for cohesionless soil show effect upon bearing capacity for various angles of friction.

BEARING CAPACITIES. Loading with Water to Design Capacity Forces Steel Cylinders Below Driven Depth. *Eng. News-Rec.*, vol. 136, no. 26, June 27, 1946, pp. 974–977. Difficulties encountered in construction of 80 by 1,300-ft wharf due to absence of expected bearing values in foundation; illustrated description of unusual pre-loading tests, in which steel cylinders were forced down to safe depths, and actual loading capacity was tested by means of large tanks filled with water.

MACHINERY FOUNDATIONS. Concrete Pipe Sections Jacked Vertically Provide Machinery Foundations, J. B. Hoffmier. *Eng. News-Rec.*, vol. 136, no. 22, May 30, 1946, pp. 856–857. Large, concrete pipe, 5 ft in diameter, was forced down by jacking against frame of building to permit construction of machinery foundation below that of building; by excavating inside pipe, four casings were put down 12 ft at cost of $433; illustrated description of procedure.

PILE. Piles and Pile Foundations—I, II, III, R. D. Chellis. *Eng. News-Rec.*, vol. 136, nos. 20, 22, and 24, May 16, 1946, pp. 774–778; May 30, pp. 863–865; June 13, pp. 914–919. May 16: Discussion of action of piles in various soils; measures to avoid settlement, load tests, and support of adjacent structures. May 30: Pile-driving formulas and determination of stresses developed during driving, by means of field measurements. June 13: Determining load-carrying capacity.

PILES, CONCRETE, REMOVAL. Special Rig Pulls Long Concrete Piles. *Construction Methods*, vol. 28, no. 7, July 1946, pp. 92–93. Long reinforced concrete piles are pulled from San Francisco Bay mud by means of barge-mounted heavy crane; gripping jaws of pile-pulling yoke are so arranged that pressure jaws transmit to pile increases as pulling force increases.

SOILS, CONSOLIDATION. Wellpoints Used to Compact Sand Fill, H. E. Berger. *Eng. News-Rec.*, vol. 137, no. 2, July 11, 1946, pp. 44–45. Sand-backfilled area to be occupied by buildings was compacted by means of wellpoint system that supplied water for flooding area; after dewatering fill, latter was compacted to 95% of maximum dry density and bearing capacity was greatly increased.

MATERIALS TESTING

BEAMS AND GIRDERS, CONCRETE-STEEL. Combined Action of Concrete Slabs and Supporting Structural Steel Beams, R. C. Manning. *Eng. J.*, vol. 29, no. 3, Mar. 1946, pp. 148–153. Article

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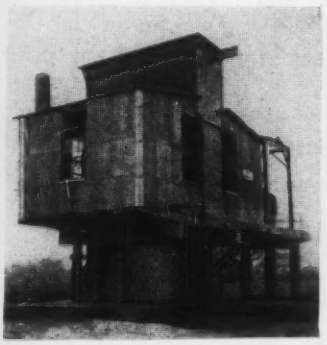

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deals with tests of steel beams encased in concrete, to determine stresses and structural characteristics of combination; it is pointed out that it is present general practice to consider steel beam as only support of live and dead load, and that taking account of additional support of concrete effects substantial savings in material; details of tests by Can. Inst. Steel Construction.

ROADS AND STREETS, SUBSOILS. Elastic-Limit Basis for Designing Highway Substructures in Clay Soil, H. C. Porter. *Eng. News Rec.*, vol. 136, no. 26, June 27, 1946, pp. 1002–1003. Compression tests conducted by gradual loading furnish stress-strain curves that clearly define elastic limits of compacted clay soils; working stresses of half elastic limit are suggested for design of highway substructures.

PORTS AND MARITIME STRUCTURES

PREFABRICATED. Mulberry "B" and Phoenix W. V. Fuller. *Junior Instn. Engrs.—J.*, vol. 56 Apr. 1946, pp. 169–179. Illustrated description of prefabricated harbors known as "Mulberries"; built in England and towed to France where they were sunk or moored, they formed pierheads and quays, floating roadways and breakwaters; data on prefabricated harbor at Arromanches, France; description of concrete caissons, general methods of construction, materials and plant, labor and welfare, lighting, and air-raid warning arrangements.

ROADS AND STREETS

AIRPORT RUNWAYS, SOIL CEMENT. Bulldozer Hoppers Spread Soil-Cement Mixture for Landing Mat Base. *Construction Methods*, vol. 28, no. 7, July 1946, pp. 95–97, 176, 178 and 179. Landing mat at Hitchcock, Tex. Naval Air Station, was made of soil cement produced in 2 pug-mill mixing plants, and spread on subgrade in 20-ft lanes with open-bottom pusher hoppers; illustrations and description of equipment and construction procedure.

AIRPORTS, SNOW REMOVAL. Heating of Runways to Combat Snow. *Can. Aviation*, vol. 19, no. 3, Mar. 1946, pp. 46, 48, and 68. System functions only when snow falls, and result is clear, dry areas, free entirely of snow, after storm has passed; consists of wrought-iron pipes, embedded in runway surface, in which is circulated hot solution with anti-freezing properties.

CONSTRUCTION. Recent Developments and Future Prospects in Highway Construction, B. E. Gray. *Eng. & Contract. Rec.*, vol. 59, no. 5, May 1946, pp. 72, 74, 76, and 78–79. Discussion of recent methods of design and construction of highways due to development of new equipment, and research into behavior of materials; recommendations for design of interstate highways; technique of utilizing immediately available soils will be added to conventional methods in future. Before Canadian Good Roads Assn., Quebec.

CONSTRUCTION, MILITARY ENGINEERING. Some Notes on Road Building, B. D. Gill. *Coast Artillery J.*, vol. 89, no. 2, Mar.–Apr. 1946, pp. 43–45. Contribution toward road construction performed by Army; illustrated description of road construction at Guadalcanal and in Germany; all kinds of material had to be used from rock and gravel up to foot-thick mat of pine needles, palm fronds, hay, coral, shells, and coal.

DESIGN. Improved Highway Design Needed. *Constructor*, vol. 28, no. 6, June 1946, pp. 37–38. Highway Safety Conference recommendations on design and construction of highways, such as greater attention to safety factors at design stage, elimination of railway-highway grade crossings, pedestrian protection facilities, skid-resistant surfaces, and modern lighting; other recommendations concerning laws and ordinances, education, public information, enforcement, and accident records.

DIRT ROADS, NEW JERSEY. 20-Year Plan for Local Dirt Roads. *Better Roads*, vol. 16, no. 7, July 1946, pp. 17–18, 24. Report on 20-year plan undertaken by N.J. State Highway Dept., aiming at improving approximately 65% of existing unimproved mileage; Sussex County was chosen for investigation both in technical respect and in connection with cost estimate; data on available funds included.

HIGHWAY ACCIDENTS. Elimination of Accident Hazards, J. C. McMonagle. *Roads & Bridges*, vol. 84, no. 5, May 1946, pp. 54–56, 98–102. Discussion of road accidents, involving fatalities and personal injuries in state of Michigan, including responsibility of drivers, vehicles, and road structures, growth of traffic; estimate of future trends; elimination of hazards requires knowledge of their causes and locations, appropriate road surfaces and types, and continuous attention. Before Michigan Highway Conference.

HIGHWAY ENGINEERING, NEW MEXICO. New Mexico Highway Problems, E. B. Ball and L. F. Root. *Western Construction News*, vol. 21, no. 6, June 1946, pp. 94–98. Abstract of report of New Mexico State Highway Dept. for 1945, which gives review of varied problems connected with road construction in desert and mountain regions of West; examples reveal department's activities, such as locating material, alkali protection, irrigated land, gypsum-bearing soils in Alamogordo airport; physical and chemical testing rooms of laboratory are illustrated.

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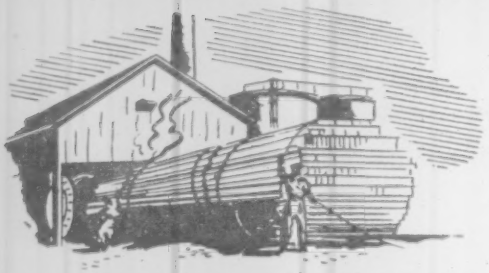

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HIGHWAY SYSTEMS, CALIFORNIA. Four-Lane Highway Construction on El Camino Real in Monterey County, V. E. Pearson. *Calif. Highways & Pub. Works*, vol. 24, nos. 7–8, July–Aug. 1946, pp. 6–7, and 32. Illustrated description of correction of congested section of highway between Santa Rita and 0.8 mile north of Crazy Horse Summit in Monterey County, Calif.; construction crosses several unstable marshy areas; unstable material was excavated to underlying hard pan; 8-in. perforated metal pipe underdrains were installed and granular material was backfilled; data on other details of construction.

HIGHWAY SYSTEMS, CALIFORNIA. Increasing Coast Highway Capacity, E. E. Sorenson. *Calif. Highways & Pub. Works*, vol. 24, nos. 5–6, May–June, 1946, pp. 22–24. Illustrated report on reconstruction and realinement of coast highway near San Diego, Calif.; description of type of construction, machine used to cut weakened plane joints on concrete pavement, and new technique for placing of stabilized base.

HIGHWAY SYSTEMS, PERU. Highway Construction in Peru, E. C. Skinner. *Roads & Bridges*, vol. 84, no. 5, May 1946, pp. 63–68, and 112. Illustrated report on highways of Peru, including mileage, type of construction, adequacy of highway system in terms of economic needs, and national policy in regard to new road construction; of approximate 2,250 miles of roads, about 1,100 miles are paved with asphalt, and remainder is surfaced with other materials.

INTERSECTIONS. Congestion Relief on N.J. Highway Promised by Overpassing Traffic Circle. *Roads & Streets*, vol. 89, no. 6, June 1946, pp. 80–82, and 101. Description of traffic circle that increases capacity of intersection of six heavy traffic roads near Camden, N.J., airport, without requiring much additional property; information on construction, equipment, and view of general layout given.

JOINTS. Asphalt Subsealing of Concrete Pavements on Mississippi Highways, A. M. White. *Pub. Works*, vol. 77, no. 6, June 1946, pp. 24–26. Illustrated description of causes, sequence of operations, quantities required, and kind of asphalt used in Mississippi highways to fill voids and seal joint from underside; safety considerations, and data on costs.

MAINTENANCE AND REPAIR. Salvaging 27-Year-Old Concrete Pavement. *Eng. News-Rec.*, vol. 137, no. 2, July 11, 1946, pp. 41–43. Illustrated report on modernization of concrete road between Dover and Smyrna, Del., by increasing width of slab with portland cement concrete and decking entire roadway with 3 in. of hot-mix asphaltic concrete; placing of concrete was expedited by use of paver; results reported satisfactory.

MAINTENANCE AND REPAIR, ASPHALT. How to Patch and Resurface with Asphaltic Concrete, W. H. Droege. *Am. City*, vol. 59, no. 6, June 1946, pp. 86–87. Ft. Wayne, Ind., uses fine-graded asphaltic concrete to patch and resurface old sheet-asphalt streets, to resurface new bituminous concrete, and to patch old concrete sidewalks; procedure is illustrated and described.

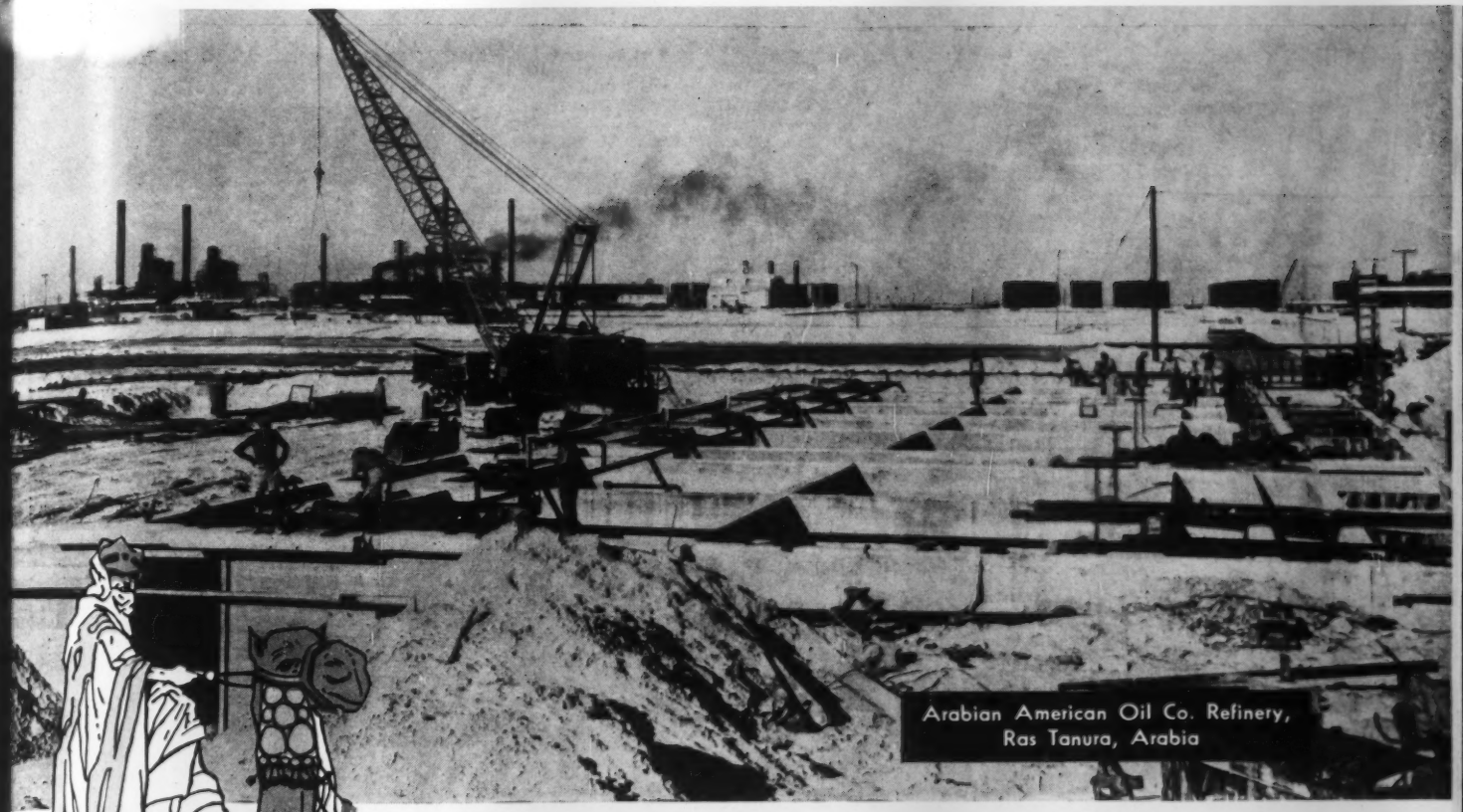
MILITARY ENGINEERING, ROAD CONSTRUCTION. Seal Coating on Guam, N. R. Bangert. *Calif. Highways & Pub. Works*, vol. 24, nos. 5–6, May–June 1946, pp. 25 and 32. Description of seal coat work on Guam; large deposits of coral used for base afforded substantial foundation for 2½ in. of asphalt concrete surfacing; data on organization, construction, and equipment.

SOIL CEMENT. Columbus, Ga., Selects Soil-Cement Paving, J. M. Graddy. *Am. City*, vol. 59, no. 6, June 1946, pp. 100–101. Illustrated report on low-cost street made of 6-in. base with 2-in. wearing surface at Columbus, Ga.; soil cement is used for sub-base while wearing surface is modified Topeka pavement utilizing local aggregate with 4½% bitumen for binder course and 6½% bitumen for top course; results are reported satisfactory.

STABILIZATION. Improvements in Methods of Asphalt Subsealing of Concrete Pavements, H. L. Cooper. *Calif. Highways & Pub. Works*, vol. 24, nos. 5–6, May–June 1946, pp. 8–10, 813. Illustrated report on experiments with semisolid asphalts instead of soil cement mixtures used for stabilizing concrete pavement slabs in California; air-blown asphalt is reported to be used successfully; description of equipment, sequence of operation, and data on costs.

STREETS, CONCRETE. Pioneer Concrete Pavements Survive 35 Years of Hard Service, K. C. Gaynor. *Eng. News-Rec.*, vol. 136, no. 24, June 13, 1946, pp. 923–924. Illustrated report on concrete street pavement built 35 years ago at Sioux City, Iowa; although methods employed in laying it were primitive by today's standards, pavement is still in service and some of it shows little sign of wear.

SUBSOILS. Construction of Highway Fills in Swamps and Bogs, G. Piette. *Roads & Bridges*, vol. 84, no. 5, May 1946, pp. 62, 112, and 114. Discussion of construction methods of building roads across swamps or bogs, taking into consideration embankment on solid bottom, and embankment floating on surface of peat until it finally reaches stability.



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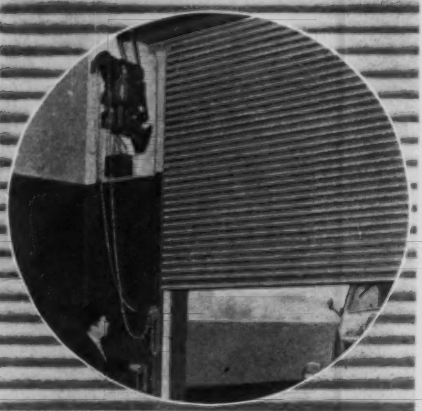

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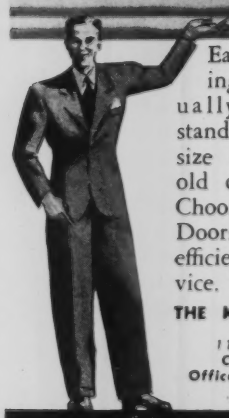

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SEWERAGE AND SEWAGE DISPOSAL

INDUSTRIAL WASTES. Responsibility for Industrial and Municipal Wastes, A. Wolman. *Am. Water Works Assn.—J.*, vol. 38, no. 7, July 1946, pp. 883–887. Discussion of problem of industrial and municipal wastes from point of view of public opinion, proposed legislation, and industrial and municipal handling of wastes.

REFUSE DISPOSAL, DIGESTION. Water-Carriage Method of Garbage Collection and Disposal with Sewage, H. E. Babbitt. *Pub. Works*, vol. 77, no. 6, June 1946, pp. 17–18, 30–31. Illustrated report on experience of disposal of garbage with sewage; discussion of size and capacity of sewer, amount of water required, effect of ground garbage on sewage quality, and quality of gas from garbage digestion. Bibliography.

SLUDGE DIGESTION. New Method of Heating Sludge Digesters, C. E. Keefer. *Water & Sewage Works*, vol. 93, no. 6, June 1946, pp. 236–238. Illustrated description of new method of heating sludge tanks at Back River Sewage Treatment Works at Baltimore, Md., by direct heating with submerged gas burners; data on heat requirements, experimental trials, selected design, and arrangement.

WATER POLLUTION. Willamette River Sewage Pollution Serious and Moving Upstream, F. Merryfield. *Western City*, vol. 22, no. 5, May 1946, pp. 34–38. Illustrated report on survey to determine sanitary conditions of Willamette River and its tributaries, and on effect of sewage and industrial waste on fish life; analysis of samples presented in charts.

TUNNELS

PUMPS, PROPELLER. Unique Propeller Pump Installation Increases Flow in Gravity Water Tunnel, D. M. Radcliffe. *Eng. News-Rec.*, vol. 136, no. 18, May 2, 1946, pp. 724–726. Illustrated report on increase in capacity of water-supply tunnel, Washington, D.C., obtained by installation of variable pitch-propeller-type booster pump; pump is believed to offer advantages for any water supply through intake tunnels.

RAILROAD, MAINTENANCE AND REPAIR. Practical Repair Methods for Disintegrated Concrete Tunnel Lining, W. W. Morrison and E. E. Seelye. *Eng. News-Rec.*, vol. 136, no. 26, June 27, 1946, pp. 998–1001. Illustrated report on repair of concrete lining of railroad tunnel of Pittsburgh & Shawmut RR., Pennsylvania; thrust blocks cast in holes cut through lining furnish spring-line support for new arch; new gutters of non-freeze type, and ample weepholes are necessity, as is backfill or packing of porous rock.

RAILROAD, MAINTENANCE AND REPAIR. Repair of Mount Royal Tunnel, C. P. Disney. *Roads & Bridges*, vol. 84, no. 6, June 1946, pp. 33–38. Illustrated description of repair of double-track C.N.R. tunnel in Montreal, following heavy damage caused by fire; data on clearing tunnel, disintegration of concrete lining, conversion of single arch to double arch by means of "prepakt" concrete, equipment and machines used, gunite sealcoat of unlined portion of tunnel, and other construction details.

SEWERS. Building One-Mile Sewer by Tunneling. *Eng. News-Rec.*, vol. 136, no. 20, May 16, 1946, pp. 788–790. Illustrated description of sewer 27 to 36 in. in diameter built below normal water table in tunnel lined with timber in good soil and with metal plate in unstable ground; excavation was done with hand tools, and concrete required within tunnel was dropped down 6-in. pipes installed at 50-ft intervals.

VEHICULAR. Road Tunnels, H. Criswell. *Roads & Road Construction*, vol. 24, nos. 277, 278, 279, 280, and 281, Jan. 1946, pp. 5–8; Feb., pp. 49–54; Mar., pp. 84–87; Apr., pp. 127–130; and May, pp. 149–153. Construction of sub-aqueous tunnels, tunnels under populated areas, and those in open country, through hills, ridges, etc., are described and illustrated.

WATER PIPE LINES

CROSS CONNECTIONS. Practices of City Water Departments in Regard to Cross Connections. *Pub. Works.*, vol. 77, nos. 3, 5, and 6, Mar. 1946, pp. 22–23; May, pp. 22–23; June, pp. 27–28. Brief abstracts of answers to questionnaire sent to about 1,000 waterworks officials; illustrations of sanitary and unsanitary connections.

WATER TREATMENT

ALGAE CONTROL. Screen Clogging by Rare Species of Algae, W. W. DeBerard and J. R. Baylis, *Water & Sewage Works*, vol. 93, no. 6, June 1946, pp. 223–224. Illustrated report on screen clogging at South District Filtration Plant, Chicago, Ill., caused by rare species of algae; rapidity with which screen clogging takes place is reported to be amazing and requires those on duty in pumping stations to be constantly on the alert; most effective means of removing algae was found to be by use of compressed air, blowing air in reverse direction of waterflow.

WATER SOFTENING, ZEOLITE PROCESS. "Los Angeles Makes Its Own Zeolite. *Eng. News-Rec.*, vol. 136, no. 18, May 2, 1946, pp. 732–733. Metropolitan Water District of Southern California has been manufacturing its own zeolite; illustrated description of method.

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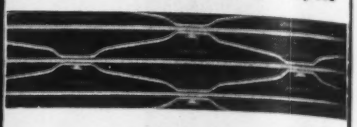

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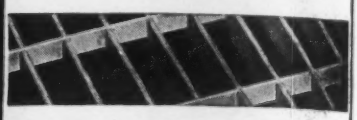

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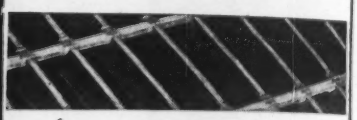

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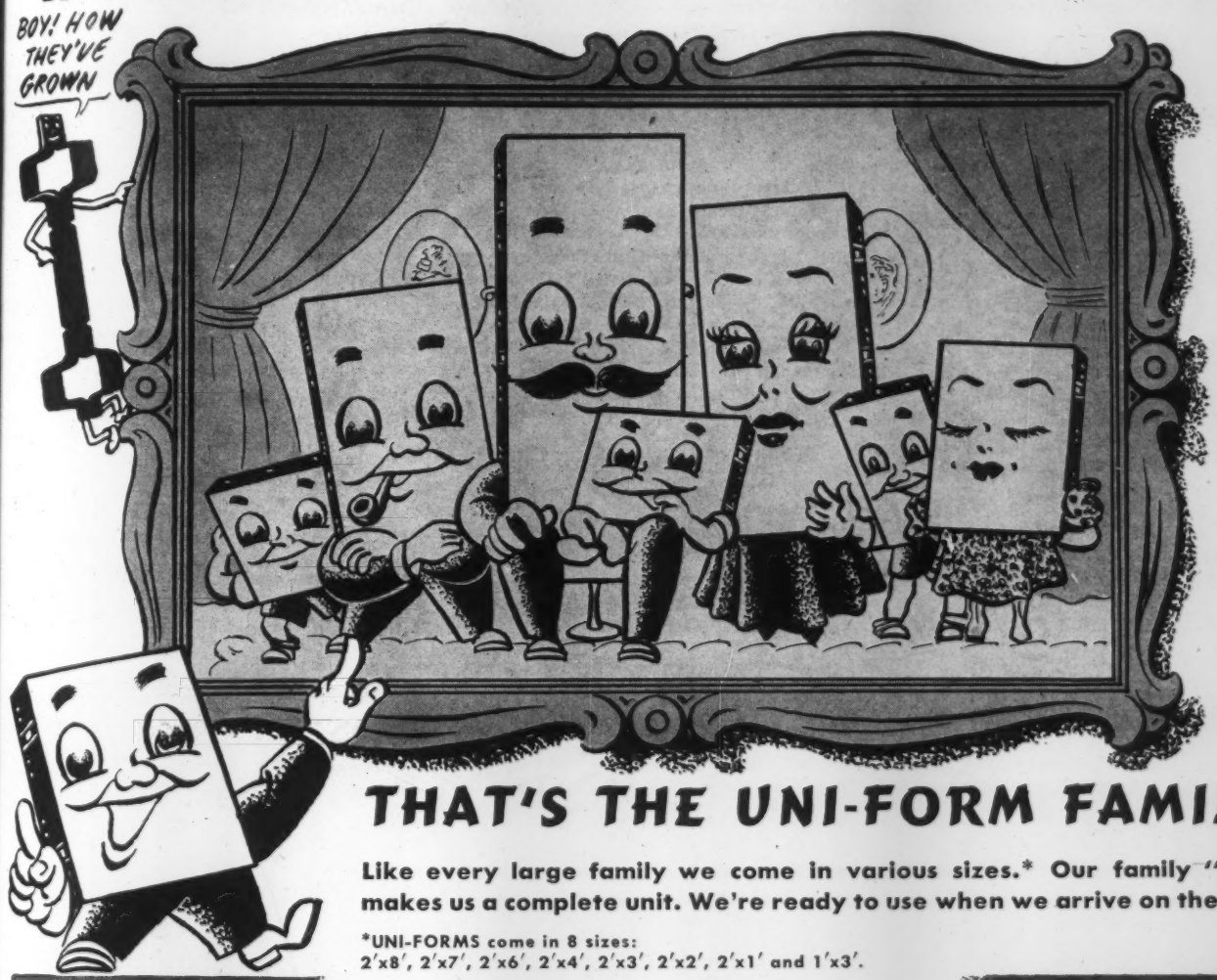

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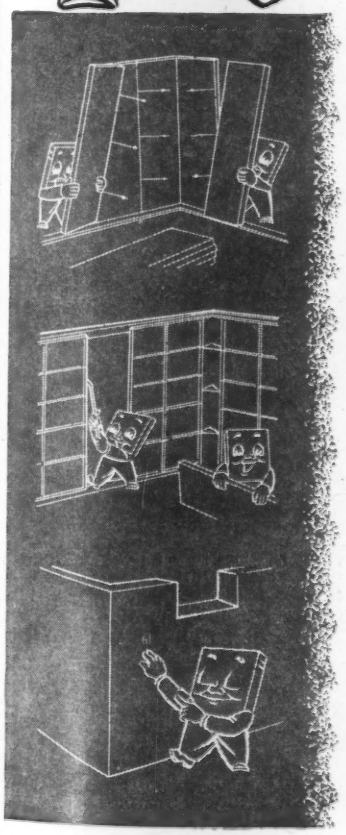

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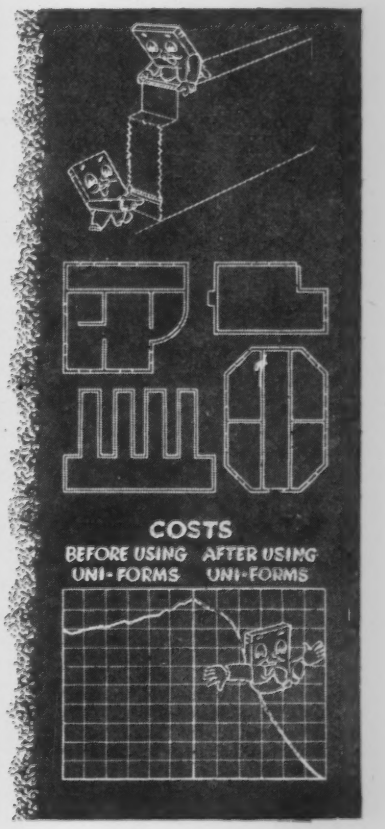

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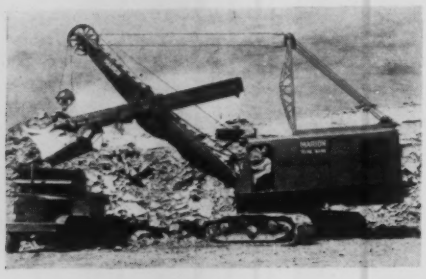
4-Yard Heavy Duty Shovel

MARION POWER SHOVEL Co., Marion, Ohio, announces a $3\frac{1}{2}$–4 cu yd machine—the Type 111-M—for heavy-duty service in mining, quarrying, stripping and general construction. This diesel-powered machine can be readily shipped without major dismantling and is also quickly convertible to dragline or clamshell service. It is of all-welded construction with a low center of gravity, and care has been given to the requirements for speed, power, ease of control, and maneuverability. Variable crawler widths and lengths are offered, making the machine adaptable to individual job requirements.

The upper machinery deck follows Marion's design and has only two main shafts, mounted in anti-friction bearings, providing direct line of power application. The Type 111-M diesel power plant, in combination with Marion air control with fully compensating type valves, places heavy-duty power at the disposal of the operator with a minimum of tiring physical exertion on his part. Control lever



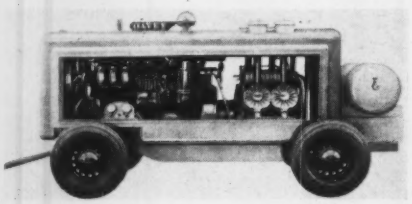
pressure is held to approximately 12 lb maximum. The fully compensating type valves give the operator the constant "feel" of the load and enable him to apply or withdraw power gradually or quickly.

The shovel boom is of all-welded, full box section construction with rounded edges for added strength, and has a wide spread base. Boom point sheaves are extra large and sheave bearings are unusually wide. Shipper shaft pinions are double shrouded. Dipper handle members are of all-welded construction with welded racking, and the handle is connected to the dipper by wide bearing bosses. The gantry, designed for quick knockdown for rail shipment, can be lowered to cab roof level by paying out on the boom hoist line.

For crane or pile driver service, the Type 111-M is equipped with a heavy-duty box section type boom with steel angles and pipe-section bracing. The boom point section is of goose-neck design which permits minimum radius operation. An independent live boom hoist may be supplied with the Type 111-M for crane service. It is completely independent of all other motions.

Portable Compressors

PRODUCTION OF THE first model in the 1947 Davey line was announced recently by Davey Compressor Co., Kent, Ohio. Known as the "315-W" (gas) and 315 WD (diesel), the machine produces 315 cu ft of free air per minute at 100 lb pressure. It is available in standard skid, steel wheel trailer, and pneumatic-tired trailer mounting styles, and flanged wheel types for railroad work. On trailers, spring-mounting is included without extra cost.



The compressor unit represents a radically new departure in Davey design. It consists of two banks of three cylinders, each bank being arranged in W form. This construction, together with a short 4-in. piston stroke, reduces compressor vibration to an absolute minimum, according to the report, and results in a cooler-operating, more efficient machine. The W design also permits substantial reductions in dimensions and weight. Gasoline-driven units have an over-all length of 140 in. while diesel machines are 12 in. longer. Height is 72 in. and width 65 in. for both machines. Gas units weigh 7,400 lb and the diesel weight is 7,800 lb. Standard gas units are currently equipped with Hercules RXLD engines, and diesels employ International UD-18 power plants. Other makes of engines will be made optional as the production situation improves. Electric starters are standard on diesel machines. Side tool boxes are included in all models as regular equipment.

Electrode Selection Chart

A GRAPHIC, FOUR-COLOR, 25 × 40 in. electrode selection chart has been published by Air Reduction to assist operators in the choice of the correct electrode for a particular job. The chart specifies which electrodes to use, shows currents, gives mechanical properties, and also includes an electrode color guide which shows the electrodes in their actual colors. Included are electrodes for mild, alloy, and stainless steels, as well as for non-ferrous, cast iron and hard-facing rods. A separate section at the bottom of the chart is devoted to special purpose electrodes. A copy of this helpful shop aid from Air Reduction Sales Company, 60 East 42nd St., New York 17, N.Y.

Post Co. 1947 Calender

POST 1947 WEEKLY Calender is said to be better than ever. It will be ready for distribution the early part of December. The popularity of this weekly wall calender is great.

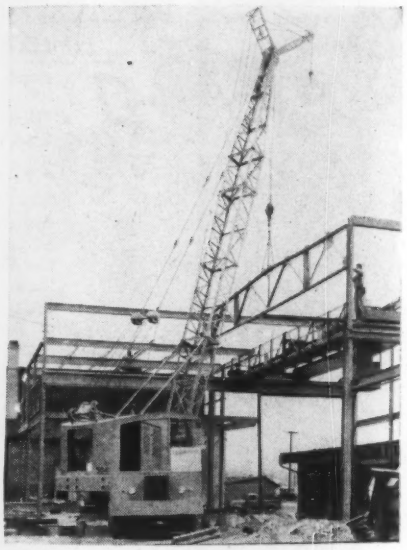
Its full size is 12 by 20 in., with a spiral bound calendar-catalog. The distinguishing features are the weekly calendar sheets with their giant size daily date numerals.

Send to the Frederick Post Co., P.O. Box 803, Chicago, Ill., for your free copy of this calender.

Truck Crane

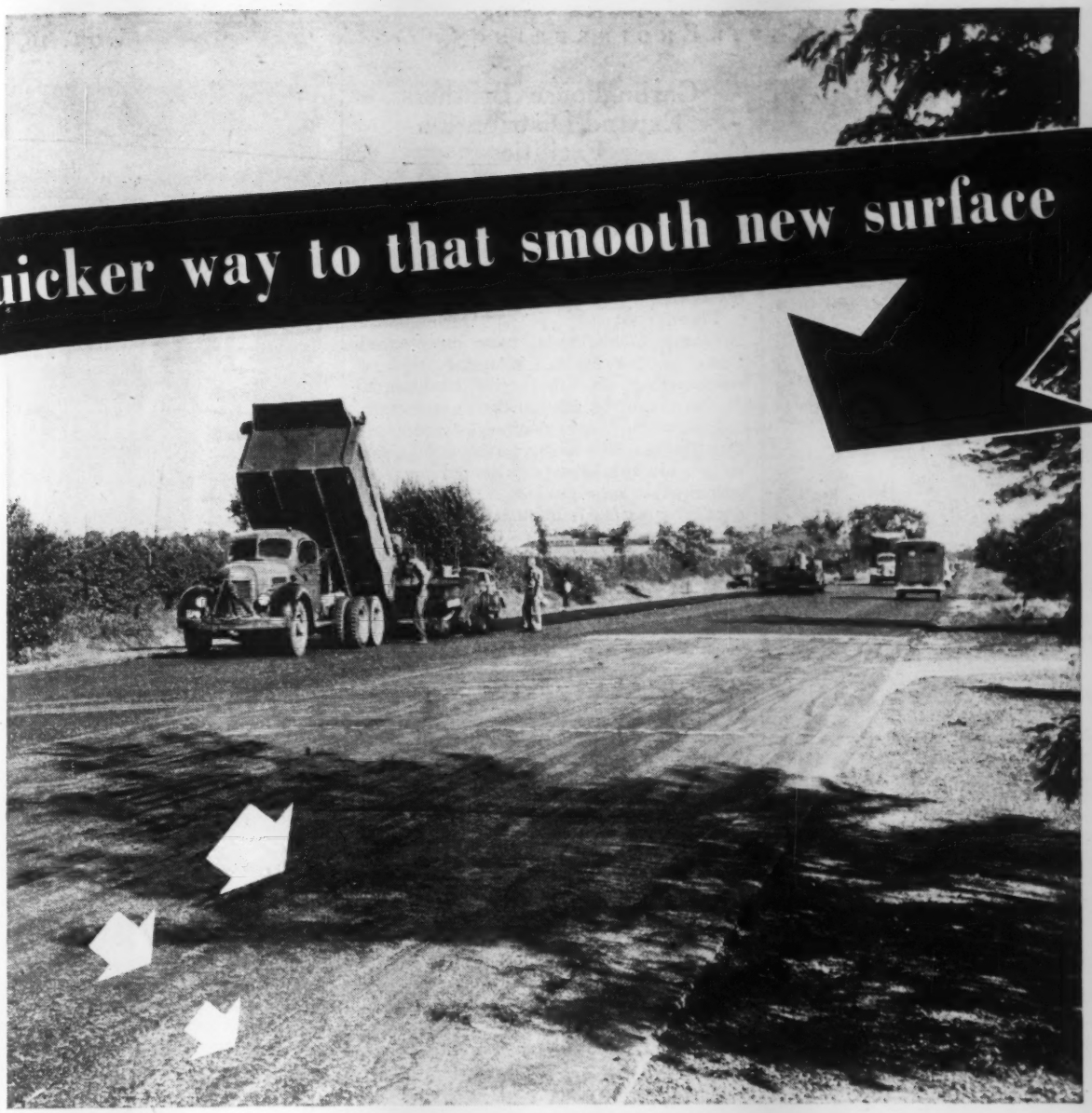
A NEW KOEHRING 304 Truck Crane has been announced by the Koehring Company, Milwaukee, Wis. Lifting capacity is 40,000 lb with outriggers, 15,800 lb without outriggers. Both are 85% ratings. The same base machine used by Koehring on their 304 crawler model is utilized on the 304 Truck Crane. Extra strength regularly built into this machinery makes it possible to turn extra stability gained by truck mounting into extra lifting capacity.

Designed for easy handling on street or highway, the 304 Truck Crane travels



right along with traffic. Because of its high travel speed, unproductive job-to-job moving time is reduced to the minimum. Hinged boom folds easily, saves time whenever the machine is moved. Pendant boom suspension simplifies changes in boom length and materially reduces the cost of boom suspension cable. Booms are available in lengths up to 110 ft. Jib boom extensions are offered in 15 to 30-ft sizes. Removable outriggers are optional, permit efficient operation as a shovel, pull shovel or dragline.

A quicker way to that smooth new surface



FACED with the pressing problem of resurfacing worn-out roads, many highway departments today are turning to asphalt for a road-top that's smooth and glare-free . . . a road that's easily patched, resistant to erosion, unharmed by wintertime de-icing chemicals.

They want this fine new surface quickly, too, and inexpensively. And here again they turn to asphalt —for asphalt saves time and money in these important ways:

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3. Asphalt can be used to widen narrow roads at the same time they are resurfaced.

4. Asphalt can be laid with a minimum of manpower and a minimum investment in road-building equipment. In fact many experienced contractors already have all the equipment necessary.

A Standard Oil Asphalt Representative will be glad to give you details of the methods and procedure followed by other highway departments now using asphalt-resurfacing to keep up their highway systems. Call the local Standard Oil Company (Ind.) office, or write 910 S. Michigan Ave., Chicago 80, Ill.

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IN JANUARY 1923, L. H. Garlinghouse and A. F. Garlinghouse inaugurated their construction equipment distributorship in Los Angeles under the name "Garlinghouse Brothers."

Throughout the years, Garlinghouse Brothers, Distributors, have represented many of the leading manufacturers of construction and industrial equipment. In the course of serving the construction industry the firm was literally propelled into the manufacturing business in order to provide specialized equipment to meet specification requirements. For the past decade or so Garlinghouse Brothers have manufactured a complete line of concrete placing equipment, concrete carts, and wheelbarrows.

Because of the growth of their manufacturing activities and the expanding construction and industrial equipment market in their territory, the name "Garlinghouse Brothers" will hereafter be identified only as distributors representing manufacturers in the Southern California territory, separate divisions being set up to divorce manufacturing operations from the basic equipment distributorship. The Gar-Bro Manufacturing Company will manufacture the established line of "up-to-date" concrete placing equipment. Gar-Bro Wheel Company, the third division, will continue to present to the trade a line of industrial wheels; a phase of the business which has developed to major proportions within the past year.

New Front-End Loader

A NEW, SMALL-TRACTOR loader with a $^3/_8$ or $^1/_8$ yd bucket and high dumping clearance of 96 in. is announced by American Tractor Equipment Corporation, 9131 San Leandro Blvd., Oakland 3, Calif. This new loader, the ATECO Model L-HG, is built for mounting on the Cletrac HG 42 Tract-Type tractor.

The L-HG has an overall height of 90 in. in digging position and 60 in. when bucket is in carrying position; thus permitting work in restricted areas. Bucket raises to clear 108 in. before dumping. The bucket pivot point is a few inches back of load center, and the bucket carrying frame is mounted so there are no uprights or superstructures to obstruct operator's view of work. Two double-acting hydraulic rams, powered by a front-mounted pump, raise and lower the bucket. A built-in radiator guard protects front end of tractor, and serves as oil expansion chamber.

The ATECO L-HG Loader will pick up, carry, and load almost any bulk material from sand and gravel to cinders and shavings. Entire units, including loader, hydraulic pump and tractor, weighs but 5250 lb. Bucket is easily and quickly interchanged with bulldozer bowl or angle bowl attachment.

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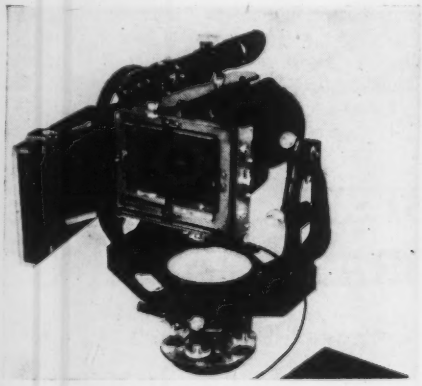
ANNISTON, ALABAMA

Camera Transit

FAIRCHILD CAMERA & Instrument Corp. Jamaica, N.Y., announced production of what it believes to be the first American-manufactured camera transit. A combination of a camera of special design and a surveyor's transit, it was developed by Fairchild engineers in cooperation with J. E. King of the U.S. Forestry Service to meet specifications of the U.S. Navy Hydrographic Office.

The Fairchild unit consists of a Type 5078-E K. & E. transit combined with a 4 × 5 in. plate camera. The camera is mounted between the standards of the transit, on the axis normally occupied by the telescope, and the telescope is mounted on the top of the camera with its optical axis parallel with the optical axis of the camera.

The camera is equipped with an $8^1/_4$-in. f6.8 Goerz Aerotar lens, a Wollensak No. 4 Shutter, with speeds of $^1/_{55}$, $^1/_{25}$, $^1/_{12}$, and $^1/_2$ second, or for time and bulb exposure—and the diaphragm stop range is f6.8 to f32. This camera, like many precision mapping cameras, contains fiducial marks in the focal plane which are adjusted by the U.S. Bureau of Standards to locate the principal point of the photograph within the specified accuracy. A level bubble within the camera is photographed on each negative, to serve as a check that the transit was leveled properly.



A counter, station number and the focal length of the camera are recorded on the film to simplify identifying the 12 photographs taken at a given station. Accessory equipment includes three filters (red, yellow, minus blue), carrying case, and plate holder box for seven glass plate holders. The outstanding use of the camera transit is in economically obtaining the necessary ground control information for aerial photogrammetry. The method consists of selecting a small number of points in an area as camera transit stations. These points would be high points, giving a commanding view of the surrounding country. Pictures are taken such that approximately one has as much of the horizon as possible at the top of the picture, and then pictures are taken at 30° intervals throughout the 360° of a circle. The resulting 12 photographs give a complete coverage with about one-half inch overlap of a complete panorama around the station. This is done at the other camera transit stations, and as a result each camera transit station shows up the one point in one of the other photographs.

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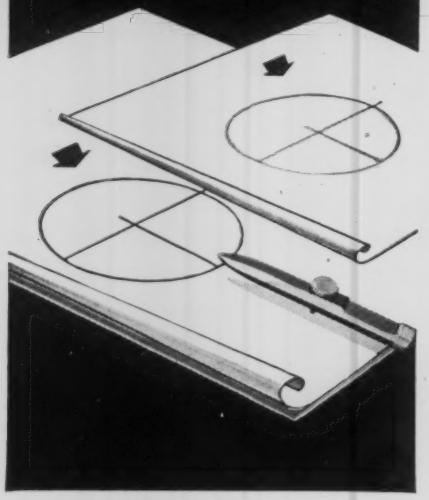

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Literature Available

COLOR FOR INDUSTRY—"Du Pont Color Conditioning for Industry," a new 32-page booklet illustrated in full color, is available from the Finishes Division, Dept. M-6, Wilmington 98, Del. Illustrating and describing years of research and practical experience with color to increase production, improve seeing conditions, and create a better working environment, the booklet makes clear the fundamental principles on which color conditioning is based. The "Three-Dimensional Seeing" treatment of machines is depicted with photographs of actual installations. The Safety Color Code for Industry is also outlined. Color Conditioning is shown at work in plants of several well-known companies. A coordinated functional color program for an entire plant is illustrated in a double-page cutaway drawing.

CONVERTIBLE POWER SHOVEL—An informative 36-page catalog has just been published by Buckeye Traction Ditcher Co., Findlay, Ohio, on the Buckeye Convertible Power Shovel, which is also known as the Buckeye Clipper. The advanced features of this versatile unit are pictured and described in detail. Also illustrated and described is the quick and ready convertibility from a power shovel to trench hoe—dragline or crane, clamshell, hook block, or magnet—or pile driver. Complete specifications with explanatory drawings are included.

DIESEL ENGINE COOLING—A new 20-page booklet, No. 351, titled "Diesel Engine Cooling Systems," has just been released by the Binks Manufacturing Co., 3114 Carroll Ave., Chicago 12, Ill. Profusely illustrated with pictures, diagrams, and blueprints, the booklet will help solve many of the problems encountered every day in diesel engine cooling. It shows how water jacket scale, overheating, costly breakdowns, and insurance rates can be greatly reduced or entirely eliminated.

ELECTRICAL EQUIPMENT—Esco Catalog No. 46-1, eight pages, two colors, describes "Rotating Electrical Equipment" manufactured by Electric Specialty Co., Stamford, Conn., manufacturers of special motors, generators, motor-generator units, converters, and other rotating electrical products. Illustrated in the catalog are numerous types of typical units which have been made by the company. Inasmuch as ESCO builds special equipment to specification and order, the catalog presents a general overall picture of the scope of their manufacturing ability. Included in general descriptions are A-C, D-C, and Universal Motors for applications not met by standard motors; Dynamotors and Converters; Motor-Generator Sets; A-C and D-C Generators; Gas and Diesel Electric Generating Plants. General specifications cover the main construction points, uses, and the range of electrical and mechanical characteristics to which other units can be manufactured. Catalog is offered free of charge.

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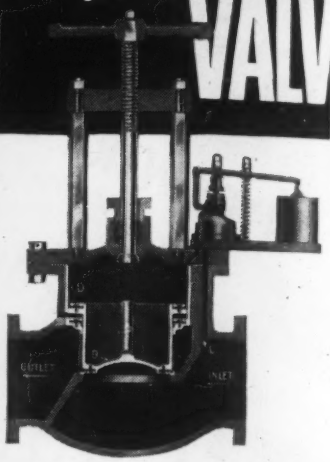

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EARTHMOVING—The basic zones recognized in modern problems of earthmoving are defined and the types of equipment, suitable to each outlined in an instructional booklet, "The 1-2-3 of Zoned Equipment," (Form 9487) published by Caterpillar Tractor Co., Peoria 8, Ill. Delineation of the zones in which power equipment, slow-speed hauling equipment and high-speed hauling equipment are utilized for maximum productivity provides the theme of this profusely illustrated publication. How "Caterpillar" products meet these zone requirements and how they adapt themselves to in-between cases are shown.

INDICATING AND CONTROL SYSTEMS—Remote indicating and control systems—what they are and what they are capable of accomplishing—are explained simply and concisely in a new 12-page engineering bulletin, 14B6641, released by the Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. How the transmitter, receiver, and indicator of such systems are constructed, how they work, their important advantages and specifications are graphically presented with photos, diagrams, and charts. Although basically a direct-current device, the system is extremely flexible in application because it can be easily operated on alternating current by the addition of a small rectifier unit.

JACKS—A new 40-page catalog, No. 203, on Duff-Norton Jacks has just been issued by The Duff-Norton Manufacturing Co., Box 1889, Pittsburgh 30, Pa. Complete descriptions, data, and specifications are given for each of the various types of Duff-Norton Ratchet Jacks, Screw Jacks, Air Motor Operated Jacks, and Hydraulic Jacks. Also shown are details on the improved Automatic Lowering Mechanism; the improved Journal Jacks; and a new 50-ton General Purpose Screw Jack of the inverted type.

MIXERS—The 1947 line of Rex Moto-Mixers is illustrated and described in Bulletin No. 46-8. Close-up photographs are used to illustrate many features. Diagrams are also profusely used to show the paths of mixing action; the rotation of the drum; the complete water system; etc. Information is given on chute lengths, and the method of mounting. Included is a complete set of specifications, photographs of each of the three drum sizes, and two pages of job pictures. Chain Belt Co., 1600 West Bruce St., Milwaukee 4, Wis.

SHRINKAGE OF CONCRETE AND MORTAR—Shrinkage of concrete and mortar—its important influence on durability and serviceability, the principal factors affecting it, and its control and elimination—are discussed in the 34-page booklet, "The Action of Embeco in Concrete and Mortars." This booklet describes the use of Embeco for Machinery and Heavy Equipment Grouting, Cement Gun Work, and Patching and Repairing Concrete. Charts, graphs and useful technical data add to the practical value of this booklet. The Master Builders Co., 7016 Euclid Ave., Cleveland 3, Ohio.

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OPEN STEEL FLOORING—The 40-page catalog on open steel flooring for bridges contains the latest engineering information on the design and selection of grating and stringers in accordance with the 1944 Standard Specifications of Highway Bridges of the American Association of State Highway Officials. The catalog concisely explains the increasing importance of this type of bridge flooring, and fully describes the various Kerlow designs and their applications for open flooring and filled slabs, with dimension charts, complete specifications, selection and installation data for each design. Kerlow Steel Flooring Co., 222 Culver Ave., Jersey City 5, N.J.

WATER FILTER—A pamphlet describing Filt-R-Stil Potable Water Units and their use in the demineralization of highly brackish waters has been issued by American Cyanamid Company, Ion Exchange Products Department, 30 Rockefeller Plaza, New York 20, N.Y. This illustrated, eight-page pamphlet includes operating data on a typical successful application of the equipment in supplying the water needs of an entire community. It lists the specifications on the standard models available, including the portable units designed for permanent installations. The mechanical and chemical theories involved are explained with the aid of schematic drawings and flow diagrams.

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